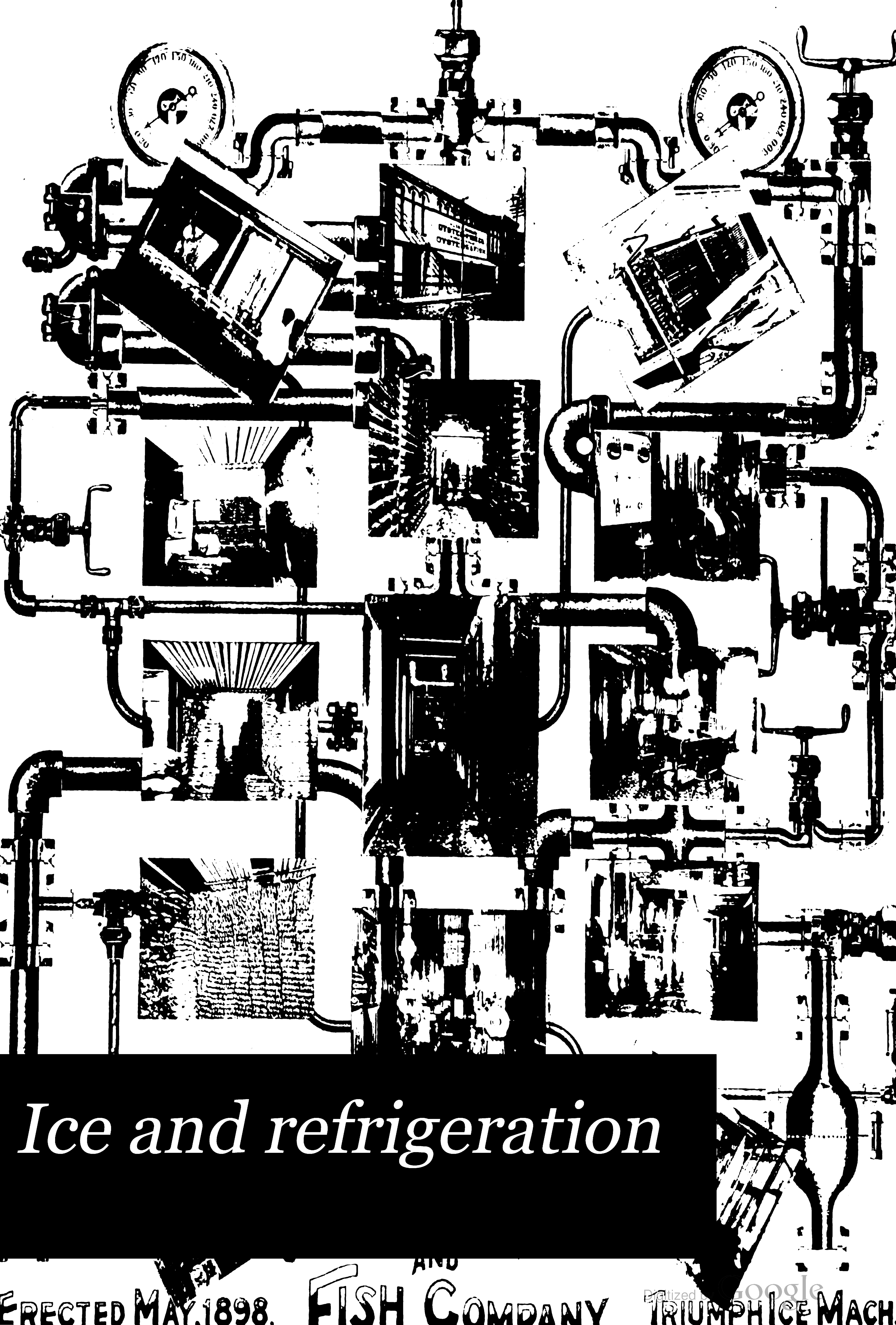
Ice and refrigeration

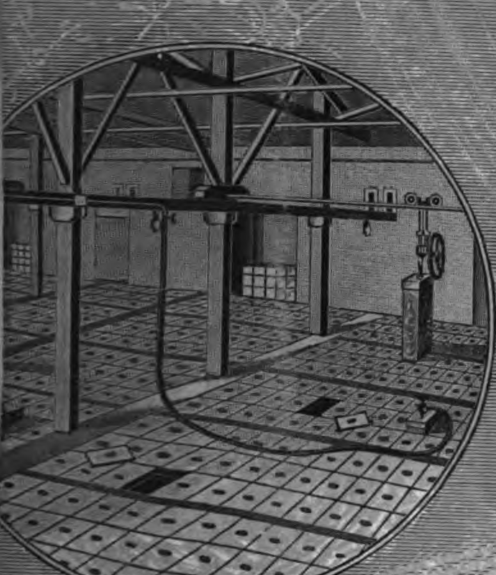


ANNEX

Vol. 18 · No. 1

January, 1900

Ice and Refrigeration Illustrated



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ILLUSTRATED

Vol. 18
Nos. 1 to 6

Jan. to June
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CHICAGO - NEW YORK.

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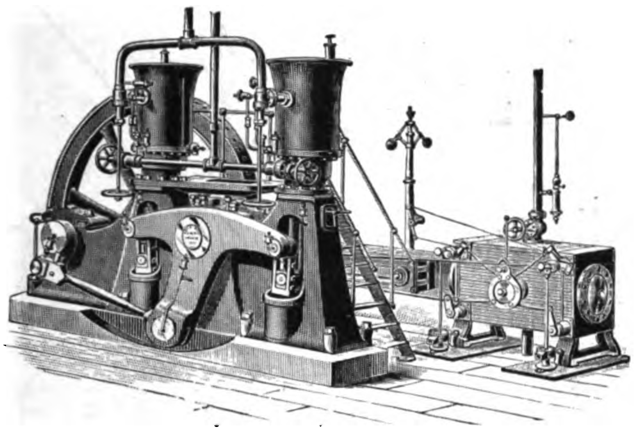

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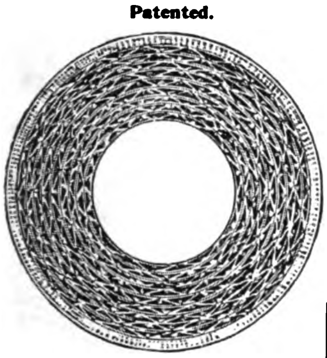
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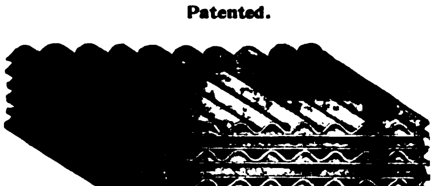
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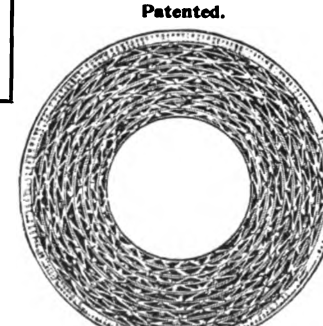
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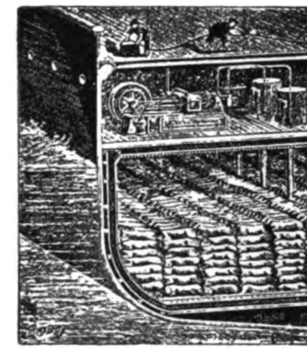

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JAS. FERNIE, Esq. (Agent for J. & E. HALL, LTD.) October 13, 1899.

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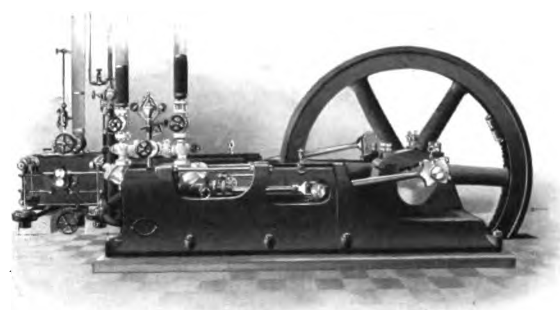

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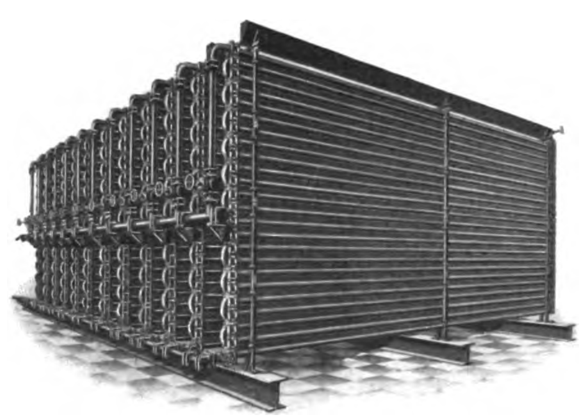

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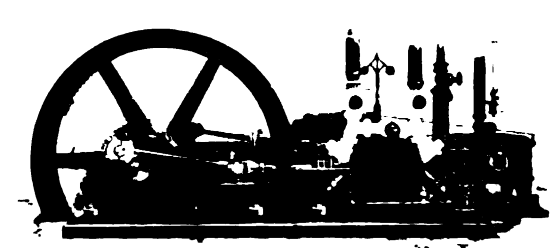

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A Monthly Review of the Ice, Ice Making, Refrigerating, Cold Storage and Kindred Trades.

VOL. XVIII. No. 1. CHICAGO : NEW YORK : JANUARY, 1900. $2.00 PER ANNUM.

[*Reprinted from* AMERICAN MACHINIST.]

INDICATING ICE MACHINES.

BIG PAY FOR INDICATING AN ENGINE—NEED AND VALUE OF AN INDICATOR—DIFFERENCE BETWEEN STEAM AND AMMONIA INDICATOR—VALUABLE SUGGESTIONS.

BY W. H. WAKEMAN.

THE first instance that I remember where an engineer received large pay for indicating an engine occurred more than fifteen years ago, and it was in one of the cotton mills of the New England states. The agent became convinced that more coal was being used than was necessary; therefore he called an expert engineer, stated the case to him and inquired his price for applying the indicator, setting the engine valves and calculating the power used to operate the works. The engineer replied, "Fifty dollars per day for whatever time it requires." This so enraged the agent that negotiations were suspended, for he declared that the services of no living man were worth such an exorbitant price. But as weeks passed away and the amount of coal burned showed that something was wrong, he again communicated with the engineer and asked for more advantageous terms. He then proposed to set the engine valves if the agent would pay him one-half of the cost of coal saved by the operation for a period of six months. As there was no chance for loss under such a contract it was closed at once. The job was done and the saving of coal commenced, but long before the time had expired the agent wanted to pay the original price asked, as he found it much the cheaper of the two propositions. The engineer would not agree to this proposition, as it had been scornfully rejected once; but a compromise was effected whereby he received much more than the first called for, although less than the second entitled him to.

This incident reminds us of the days when the indicator was regarded as a mysterious instrument, understood by a few only, and far beyond the reach of the average engineer. It appears as if we had now gone to the other extreme, for in many cases it costs steam users nothing to have their engines indicated. This is due to the fact that, as a rule, engineers are much more familiar with this instrument than they were twenty years ago, and also because hundreds of them are in use now where one was formerly. The natural consequence of this state of affairs is that the whole matter is considered of less value than when the service cost more, for in some cases steam users scarcely care to have their engines indicated, even if there is no charge.

In a certain case a steam user wanted some diagrams from his engine, and asked an expert engineer to take them for him. The request was complied with, although, on account of local conditions, it was somewhat difficult. After the job was finished, the steam user very politely thanked the engineer for his services, and dismissed the whole matter. One object of this article is to protest against a practice which so belittles the services of competent engineers. In other cases engineers have charged nominal fees, which did not yield them good laborers' wages when all of the time involved was taken into consideration, and this also is unsatisfactory. I am free to admit that some engineers are not experts in the use of this instrument, which is one reason for their willingness to work at a low rate. They must secure practice somewhere, but their victims are not always benefited by the operation.

The plan adopted by some of the engineers' associations that own indicators and allow all of their members to use them is an admirable one, as it gives them a chance to become familiar with its care and operation; but this does not necessarily make each one an expert. Where the engine in question is a small one, it does not pay to invest a large sum in expert service; therefore the engineer in charge of such a plant should learn enough of the instrument to enable him to take diagrams properly and to set the valves on his engine so as to secure the best results. Every engineer who has any pride concerning his standing among the craft will consider this a part of his regular duties, as he should count it a disgrace to have an outsider come into his engine room to do such work, for it is certainly no credit to him, especially when an indicator costs no more than a bicycle, and none is too poor to own one of them. I do not claim that it is necessary for him to learn all of the calculations that can be made in relation to the diagrams and what they show; but he should understand how to set valves properly by it, for there is no other way to do this important part of an engineer's work. If he does not

care to exert himself to this extent, he should never complain because his employer does not take his advice concerning matters in connection with the plant, nor consult him when renewals, repairs and additions are to be made.

It is generally admitted that an indicator is a necessary adjunct for a steam plant, either for daily or weekly use, or else for proving the condition of the engine at longer and irregular intervals. It is not so generally admitted, however, that an indicator should be applied to the ammonia end of a compression ice machine in order to show the exact condition of its piston and valves; but as this class of machinery is coming into very general use the subject is worthy of special attention. The ammonia end of the machine is commonly called a pump, and as very few people ever think of indicating the water end of a pump, the ammonia cylinder is treated in the same way. This is a great mistake, for while it is of equal importance with the steam cylinder, so far as necessity for exact adjustment is concerned, it handles a gas that is far more liable to leak past valves and pistons than water is, and, furthermore, the pressure at which the gas is used is greater than the steam pressure necessary to operate the machine, which increases the difficulty of successful and economical operation.

If the same indicator was proper for both steam and ammonia cylinders, it might be that it would be more generally used, but inasmuch as the moisture in steam will rust a steel indicator, and ammonia will destroy a brass one, it is necessary to use two kinds where durability is a consideration. It is quite possible for the expansion of metals to cause an ammonia valve to "hang up" for a portion of the time, destroying the useful effect of the machine, or, if the valve reaches its seat, it may not make a gas tight joint, even though it may look all right when taken out and examined; or the piston may leak badly, thus allowing gas to pass from the delivery to the suction side, reducing the efficiency of the machine, and at the same time causing unnecessary wear.

There is a class of engineers to be found who claim to be superior to their fellows because they do not need an indicator to tell them what is going on inside of their cylinders; and yet they give no evidence of ability to see clearly through cast iron, and without this accomplishment they need this instrument the same as less pretentious engineers do. In a certain establishment where refrigerating machinery is used the results were unsatisfactory, and a so called investigation was begun. Two compression machines of a standard type were in use, and, after all due deliberation, it was decided that another one must be installed in order to provide the necessary amount of refrigeration. Now, the chief engineer in charge of this plant was not a novice in the business, neither was he one of those unappreciated, underpaid, and consequently discouraged, engineers whom we occasionally meet; but, on the contrary, he was well paid and highly appreciated—in fact, much more so than he deserved, judging by the results obtained. He did not decide the matter alone, but called in the chief of another plant of the same type, yet neither of them singly, nor both of them together, discovered the true cause of the trouble. While the firm was contemplating these expensive alterations which had been suggested, a combination of circumstances caused them to dismiss this engineer and hire another. The new man wanted an ammonia indicator, as he decided that the machines were not working to the best possible advantage; but, not having one, he did the next best thing. He took one of the machines down and found a very bad defect in it that the indicator would have disclosed the first time that a diagram was taken with it. I cannot claim that the indicator showed this defect, for it was not used, but if it had been applied early in the season the trouble would at once have been located and a remedy devised, while as it was the machinery was run in a decidedly wasteful manner during the entire summer, because there was no time to dismantle the whole apparatus and search for defects. After this change was made one machine did the work, except during very warm days, when the other was used to supply a small deficiency; but who could claim that they were in the best possible order even then? Certainly not the present engineer, for he claims that they do not work perfectly yet, but he needs an ammonia indicator to point out the exact location of the trouble, if there is any, and, if not, to show that everything is in perfect order. A good indicator for use in this work is rather expensive, but in this case it would have paid a higher rate of interest on the amount invested than any other money used by that concern—and they are getting rich fast, too.

I am of the opinion that the relation of this incident will fail to stir the proprietors of cold storage warehouses and ice making plants to action as it should, for the simple reason that as each one reads it he will conclude that the moral applies to his neighbor only, when in reality it is meant for each and every man who owns—or is the engineer in charge of—one of these plants.

There are many points to be taken into considerations before a diagram from an ice machine can be pronounced perfect, or rather as indicating perfect conditions in the cylinder, and these I shall not attempt to explain here, as it would occupy too much space, but I wish to impress upon the minds of all readers the idea that a casual glance at such a diagram will not suffice to show up its weak points, for it must be studied carefully and several tests must be applied before all of its possible revelations are investigated, enabling the engineer to render a just decision.

THE use of liquefied carbonic acid gas to extinguish underground fires has been dealt with by Mr. George Spencer in a paper read before the Institution of Mining Engineers. An instance was cited of a fire that occurred in a heading of a colliery with which Mr. Spencer was connected. It was decided to use carbon dioxide to put out the fire, and six cylinders of the liquefied gas were successfully used. It was suggested that in case of fire on shipboard the use of carbon dioxide might prove invaluable, as it can be instantly applied and would save much damage by water to the cargo.

[*Abstracted from the* SCIENTIFIC AMERICAN.]

A LIQUID AIR PLANT.

OSTERGREN & BERGER'S PLANT FOR THE MANUFACTURE OF LIQUID AIR—DESCRIPTION OF MACHINERY AND PROCESS —LIQUID AIR VESSEL—VIEWS.

A PLANT for the liquefaction of air and other refractory gases was completed and put in operation in New York city recently, a description of which, based upon data furnished by the inventors of the machinery, Messrs. Ostergren & Berger, will prove of interest to our readers.

We pass over the details of the filtering, purifying, cooling, drying and separating apparatus, as simply auxiliary, and liable to be changed at any time, when experience shall suggest improvements. All of these parts, however, show great ingenuity in design. At every point throughout the works regulating and safety valves are provided, and pressure gauges enable the engineer to see at a glance the exact working condition of the machinery.

The liquefying apparatus is protected by patents, both in the United States and in the principal foreign countries. It is claimed that at the time these were the only patents which had been granted in the United States upon apparatus for liquefying air or other gases.

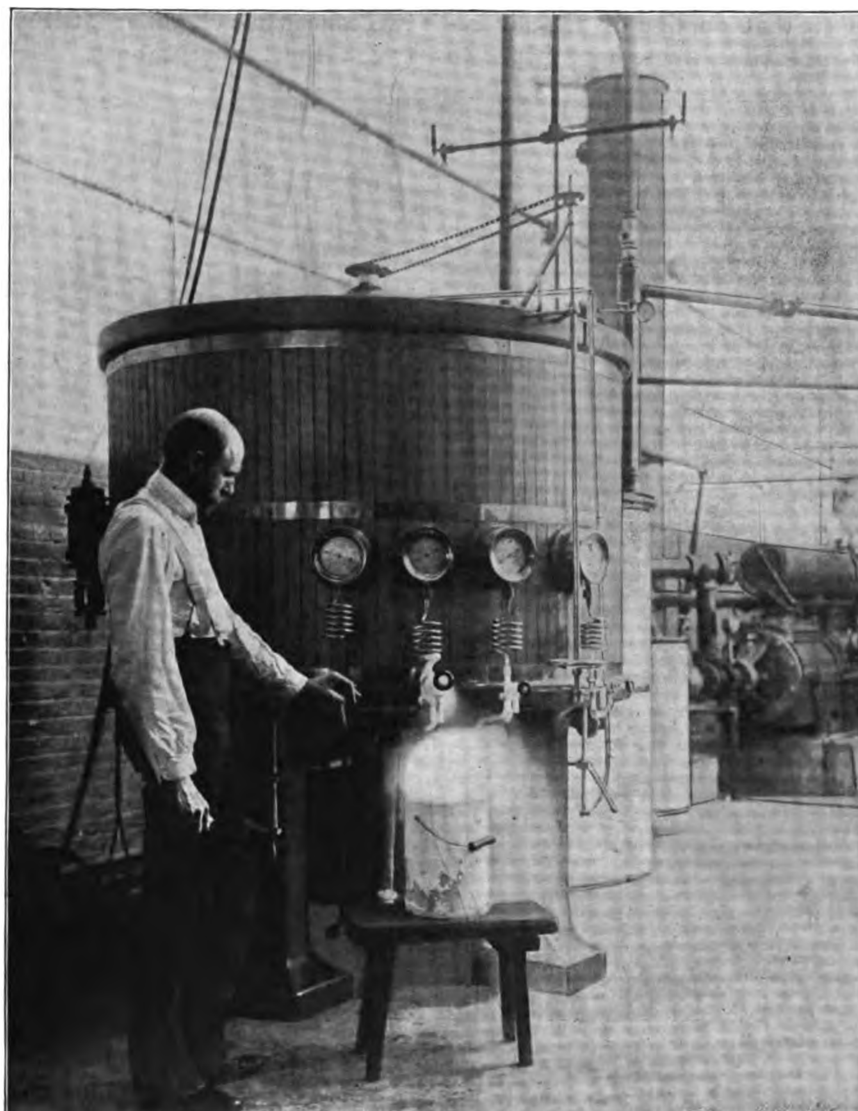


FIG. 1.

The compressors for this plant were built from special designs, made for the purpose. The quadruple compression system is employed, divided between two independent compressors, No. 1 and No. 2, Fig. 2. Compressor No. 1, shown in this figure, has air cylinders eighteen and one-quarter inches and twelve inches in diameter, respectively. The initial air pressure in the first compressing cylinder varies from zero to ten pounds per square inch absolute, as may be required, at which pressure the air enters partially from the air compressor and partially from the atmosphere at such a reduced pressure. The second compressing cylinder brings the pressure up to eighty pounds per square inch, with a piston speed of 300 feet. The power required for this compressor aggregates about sixty horse power.

Compressor No. 2, shown in Fig. 2, has air cylinders seven and three-fourths and seven inches in diameter, respectively. The initial pressure in the 7¾-inch cylinder is eighty pounds per square inch, and this is raised to 300 pounds terminal pressure, which is the initial pressure of the fourth and last cylinder. This fourth cylinder receives all the air from the third cylinder, the rest of the displacement being supplied by the return current from the liquefier, as will be shown later. In this cylinder the charge is compressed to 1,250 pounds per square inch, which is the pressure usually employed in the machine. The indicated horse power of compressor No. 2 is about 100 horse power. The total horse power used by the two compressors is thus about 160 horse power. This exceeds any plant hitherto reported, by about 50 per cent.

The air as it passes from one compression cylinder to another is cooled in the ordinary manner by water jackets. The inflowing air from the external atmosphere is passed through an air filter, shown in the sectional view of the apparatus, Fig. 5, to remove its mechanical and other impurities before entering the compressors.

After leaving the compressors the air passes to the brine or equalizing tank, Fig. 5, where the coil through which it flows is in close contact with the coil which carries the expanded air from the liquefier back to the fourth compression pump. In the brine tank the temperature of the air under high pressure is reduced nearly or quite to that of the expanded air in the return coil.

From the brine tank the air enters a tall separator, Fig. 5, in which the moisture, oil, and any other impurities are removed from it. Here it bubbles up through a tank of water and passes a system of baffle plates. From the separator the air enters the

condenser, or liquefier, at the temperature of cool water, and under a pressure not to exceed 1,250 pounds per square inch.

In the air condenser, or liquefier, there is a complete departure from former models. The system employed is that of "self-intensification of cold," as it has been termed, which appears to have been first employed by Cailletet in 1877 for liquefying oxygen, and which is fundamental in all the machines which have produced liquid air in considerable quantities. A portion of the air under high pressure is allowed to escape from a valve, as in Linde's machine, and is expanded, while its pressure drops from 1,250 pounds to 300 pounds per square inch. There is thus produced a large and continuous fall of temperature which ultimately causes that portion of the air remaining in the high pressure system of pipes to liquefy. While this method of cooling a gas below its point of liquefaction is not new, the design of the apparatus and the attention to the details of economical working are novel, and differentiate it completely from its predecessors. A detail drawing, both in plan and elevation, is presented in Figs. 4 and 5, showing its completed form. It is about seven feet high and its upper part is six feet in diameter.

The object had in view by the inventors was the most complete insulation from the heat of the external atmosphere during the process of liquefaction, and also the under-cooling of the air to such an extent that it would not at once return to the gaseous condition again upon being drawn out of the liquefier. In all previous machines the air has been brought only to its boiling point, or at best a very little below it, in the liquefier; and when drawn out into the open air, it boils with great violence, and a considerable proportion returns to the gaseous condition; nor has any one hitherto succeeded in preventing this waste to any great extent.

In the sectional elevation of the liquefier, Fig. 4, the cooling of the air to the point of liquefaction occurs in the upper or larger, and the under-cooling takes place in the lower or smaller portion. The current of air, under a pressure of 1,250 pounds to the square inch, enters the liquefier through the stand pipe on the right, from which thirty-six copper tubes of ⅝-inch diameter and 200 feet long lead in flat spirals toward the center of liquefier, as shown in the plan, Fig. 4. Here they connect with a casting containing two concentric chambers, with a regulating valve between the two chambers. This valve is controlled by the wheel shown at the top of the liquefier, Fig. 5. Passing this valve, the pressure drops from 1,200 to 300 pounds per square inch, and the greater portion of the air at this reduced pressure flows through the second chamber of this casting as a return current into a similar set of thity-six tubes to the exit pipe, and so goes back to cylinder No. 4 of the compressor, to be raised to 1,200 pounds and sent on its round again. The two sets of spiral tubes are soldered firmly together, thus forming a vertical wall of seventy-two tubes, and inclosing a spiral space leading from circumference to center of the liquefier. An important use is made of this space, as will be seen later.

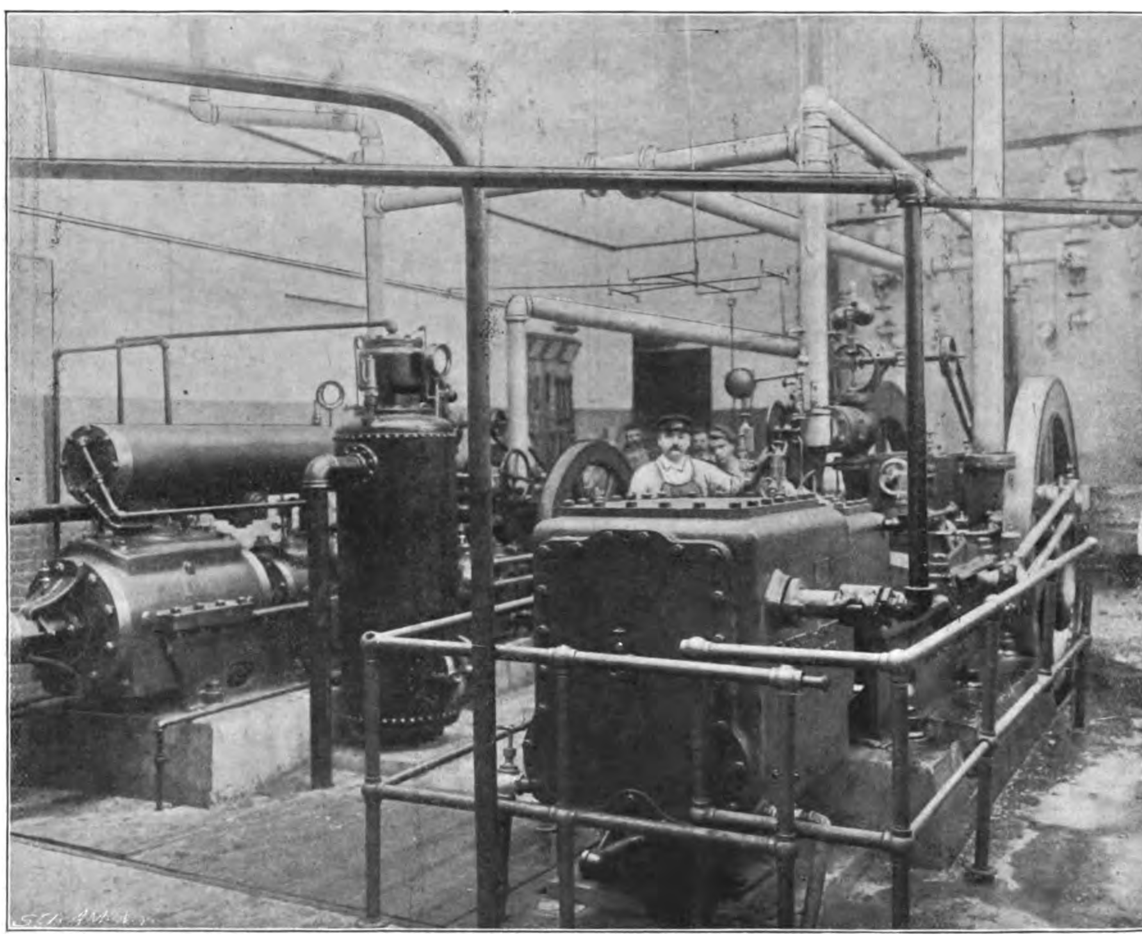


FIG. 2.

The heat of the inflowing current of air under high pressure is absorbed by the returning low pressure current which has been cooled by its passage through

the regulating valve and its expansion on its return path. This action is so complete that the inflowing and outflowing current have practically the same temperature in the pipes just outside of the liquefier, as has been mentioned above. From the chamber just below the regulating valve a part of the air, which is under a pressure of 300 pounds and either liquefied or just on the point of becoming liquid, is allowed to

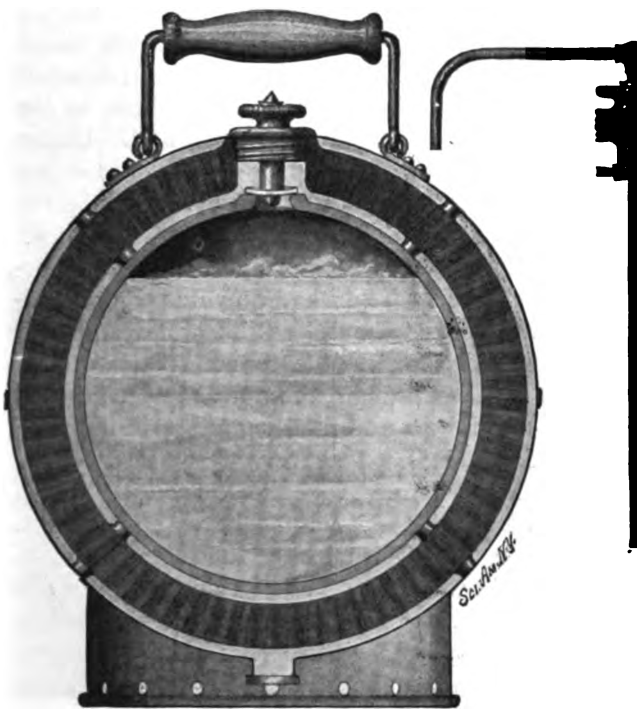


FIG. 3.

expand a second time to a pressure of ten pounds absolute in the under cooler, which is seen below the liquefier in the sectional drawing, Fig. 4. The portion of the air which is expanded the second time is drawn out of the under-cooler as return current No. 2 by the suction of compressor No. 1, passing through the channel formed by the spiral turns of the wall of seventy-two tubes described in the liquefier, thus keeping the space around and between these tubes at a very low temperature. This expanded air enters again upon its round of compression and coolings, and in its turn contributes to the liquid product of the machine. The total cooling surface inside the liquefier is 2,200 square feet.

It will be seen that there is no waste of air which has once been compressed and partially expanded, and that the only loss of air in the machine is the quantity of air which is liquefied. This is supplied from the atmosphere in the manner described above. It will be noticed also that the portions of the apparatus in which the liquefaction and under cooling take place are most completely protected from the accession of external heat by means of the return current from the under-cooler of very cold air, expanded to a pressure less than normal by the suction of compression pump No. 1, which produces a vacuum from zero to fifteen pounds, as may be desired. It is thought that the liquid air could even be frozen in the lower portion of the under cooler, by evaporating liquid air in the vacuum produced by pump No. 1.

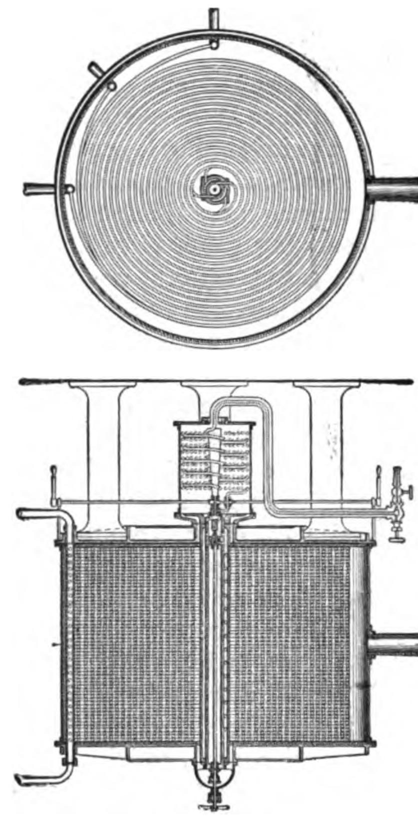


FIG. 4.

The importance of the spiral space between the coils of pipes in both the liquefier and under-cooler will now be seen. It is traversed continually from center to periphery by a current of cold and rarefied air, which thus surrounds the working parts of the machine and insulates them from external heat, so that no especial packing is required, as is necessary in all other liquid air machines. But the production of liquid air is a matter of small moment unless some means for preserving it can be devised. This has been provided by Messrs. Ostergren and Berger in

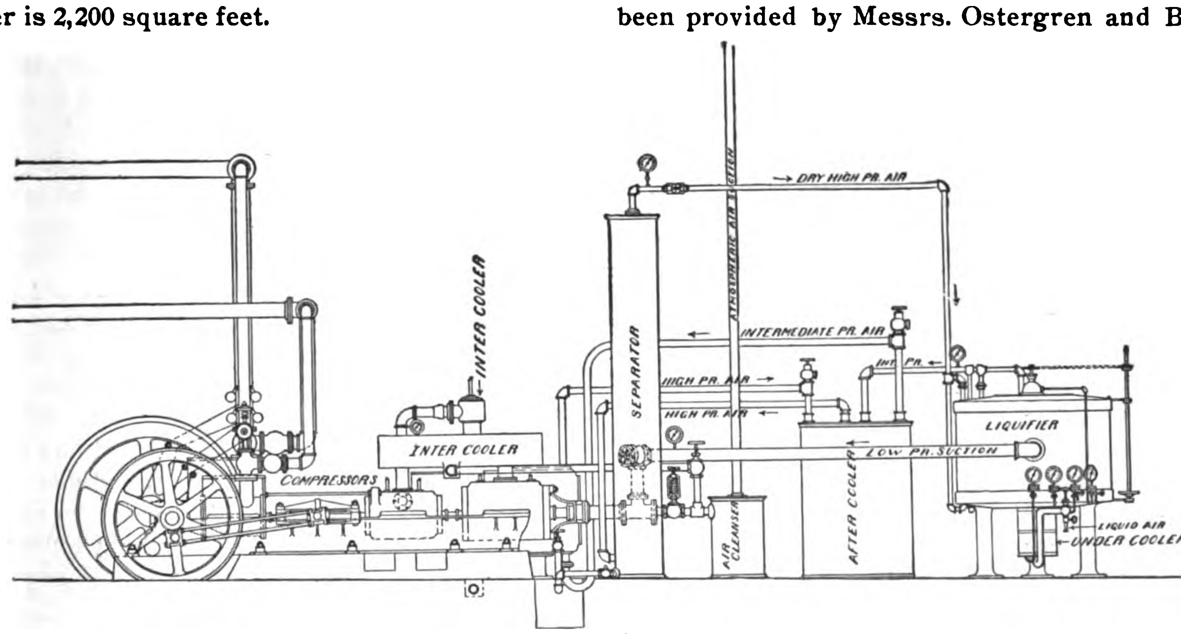


FIG. 5.

their receptacle for liquid air, Fig. 3, upon which the claim has been allowed in the United States patent office. Numerous forms and sizes of these receptacles have been designed for special uses. The illustration shows one which will hold three gallons. The central vessel is a sphere of copper. This is surrounded by an air space in the form of a spherical shell. Outside of this is an insulating layer which may be composed of any desired material.

This in turn is surrounded by another air space between the insulating layer and the external vessel. A poppet valve closes the opening into the inner vessel, which may be adjusted to any desired pressure. The expanding vapor from the inner vessel lifts the valve and passes into the space surrounding the vessel of liquid air. In order to reach the external atmosphere this vapor of air must pass through the insulating layer and then fill the external spherical air space. To emerge from this it must open a valve shown in the bottom of the receptacle, which is adjusted to work at any desired pressure. Thus the air expanding from its liquid form is made to cool the entire external space surrounding the liquid in the interior of the receptacle, and in order that heat from the atmosphere may enter the receptacle, it must pass in the opposite direction to the air which is escaping from the receptacle. To the receptacles pressure gauges may be attached. For the purpose of removing the air, a tube extending to the bottom of the receptacle is provided, which operates upon the same principle as the so called syphons of mineral waters.

An interesting experiment was made by opening the valve at the top of the liquefier, which showed that even in that part of the machine the temperature of the air was so low that it could be liquefied by allowing it to expand. The jet of escaping air liquefied, as could be plainly seen. There was distinct stratification, the alternate layers presenting a milky and transparent appearance. There was apparently a set of waves produced by vibrations set up in the out rushing current at the edge of the nozzle.

From the indications of the gauges it would seem that the under-cooler could be increased considerably in capacity, and output made correspondingly larger.

The desire of certain parties to utilize liquid air for commercial purposes, resulted in an order for a plant to be set up in Los Angeles, Cal., with a capacity of 180 gallons of liquid air a day. This is to be used for refrigeration in the shipment of fruit from Los Angeles to Chicago, as heretofore noticed in the news columns of ICE AND REFRIGERATION. In this plant new features intended still farther to increase its efficiency will be introduced. The result of this first projected application of liquid air to practical refrigeration, on a scale sufficiently extensive to furnish results definite and valuable as data for future operations, will be watched with much interest.

THE exports of ice during the month of October, 1899, reached 1,442 tons, valued at $3,279, as against 1,315 tons, valued at $3,320, for the same period of 1898. For the ten months ending October 31, 1899, the total exports of ice amounted to 13,177 tons, valued at $28,886, as against 21,068 tons, valued at $39,378, for a like period in 1898.

ICE AS AN EXPLOSIVE.

THE United States government has been having dealings with the junk man. It has sold an immense quantity of old projectiles in the Brooklyn navy yard to the Penn Iron Works, of Chester, Pa., at second-hand rates.

These projectiles range in diameter from eight to fifteen inches, the latter being a popular form of cannon ball during the civil war. In the lot were 646 15-inch shells, 2,200 8-inch shells and 6,000 9-inch shells. They were sold to the first buyer at one-half a cent per pound, and he disposed of them to the Penn Iron Works at about a cent a pound. Under this arrangement the latter pays about $3 each for the larger shells of 300 pounds, and $1.50 apiece for the smallest.

The projectiles are sold merely because they occupy valuable space. They had no value to the ordinary junkman, because he did not know how to break them up, and it is impossible to melt them in one piece. The man who bought them first broke several pile drivers upon them and finally gave up in despair.

American ingenuity, however, was equal to the task of smashing them. A genius employed in the Penn Iron Works hit upon a novel way of doing it. He will arrange the shells with the fuse holes upward, and wait for cold weather. When this comes he will fill them with cold water. This will freeze. When water freezes it expands with terrific force. The expansion will smash the shells as if they were so many walnuts.

This peaceful method of exploding the shells resembles the turning of a sword into a pruning blade, the popular simile of the poets. It may also point the way to some ingenious inventor who wishes to discover a cheap application of force. Perhaps the ice power machine will be developed as a result of the frigid explosions at the Penn Iron Works.—*Louisville Times.*

THE RESISTANCE OF SEEDS TO COLD.

PROFESSOR PICTET, of Geneva, has found that even a temperature of —200° C. did no harm to bacteria; in fact, they bore it for weeks together with indifference. Seeds of plants can also stand the severe cold without losing their fecundity, or, indeed, taking any harm at all. This was shown to be the case as far back as 1884 by Candolle and Pictet, when they subjected seeds to a test of —100° C. during a period of four days. In 1893 Pictet raised the test to —200° C. without damaging the seeds. Then again in England, in 1898, Messrs. Brown and Escombe worked in temperatures of —183° C. to —192° C. This included barley and oats. The seeds had been well dried down to 10 per cent to 12 per cent of moisture, and they remained 110 hours in the above temperature. Then they were carefully thawed—a proceeding that occupied fifty hours. The testing of their sprouting power followed, and it was found that they were in this respect in no way inferior to the seeds that had not been exposed to cold. The result in growth (fruit) was strong and good, and the yield in seed was also good. It is now desirable to know what would follow an exposure to a temperature of —273° C., the new zero.—*Wiener Landwirtschaftliche Zeitung.*

ICE DELIVERY IN VENICE.

AS everybody knows, Venice, Italy, lies virtually "in the water." Its streets are canals, its carriages gondolas. The only horses in the city are the four bronze horses on the facade of St. Mark's cathedral. But the Venetians are enterprising and know the luxury—yes, and the economy—of ice.

Through the courtesy of Mr. Charles L. Loney, traveling representative of the National Ammonia Co., of St. Louis, Mo., we are enabled to present our readers with the accompanying illustrations of Venetian ice deliverers, reproduced from snap shot photographs taken by Mr. Loney on a recent visit to this unique city.

The ice is manufactured in blocks, 4×6 inches in size and forty inches long, weighing about forty pounds each. The ice carriers, who deliver the product of the factories, have a peculiar kind of wooden box strapped to their backs, which is loaded, usually, with two blocks, or 80 pounds, of ice. They go about from place to place to reach their customers, in gondolas. The ice sells for one lira per fifty kilos (about fifteen cents per 100 pounds in our money and weight). One can imagine these ice men shouting their wares in the musical language of Italy, while the exposed blocks are rapidly turning into their original fluid state in the warm, sunny air of Venice. It is not so easy to imagine how these peripatetic ice men would supply a fete day demand of even a moderate sized modern American bar. But labor is cheap in Venice, and the man with the tub or box full of ice might be content to make numerous trips to gratify some uncommonly generous or extravagant customer. Our correspondent does not mention the cost of making ice in Venice, but some idea may be gained when it is told that the manufacturer pays $8 per ton for his coal.

——United States Consul General Gudger, Panama, Colombia, South America, writes that a decree has been promulgated by the Colombian government making the slaughtering of cattle and the sale of meat a government monopoly. It prohibits all owners of cattle from selling meat, except to employes of the government, under a penalty of $1.00 for each head sold.

HOW'D YOU LIKE TO BE THIS ICE MAN?

THE ice man has been much maligned. There is no doubt of it. The popular love of sarcasm has been vented upon him. In reality he is a philanthropist, the proof of which is to be discovered in a communication from one of our valued correspondents, published in full below. What is shown there is not opinion, but cold fact, very cold fact. We commend it to the attention of the public and of the ice man.

To the Editor: A northern man traveling through the south often sees things down here that amuses him. I lay claim to discovering one of the most unique things in our line.

Inclosed a circular which I found tacked up in a hotel at this point, and which will prove my claim to distinction.

We have never believed all that the newspapers said about the rapacity of the ice man, and this is a proof that the ice man is sometimes a philanthropist. Yours, M. R. CARPENTER.

This circular was as follows:

ICE! ICE! ICE!

Ice at as low rate as can be had anywhere. Always have as much as two car loads on hand. Not in the business for the money there is in it, but simply to accommodate the people with ice.

Will show my appreciation of the people's patronage by

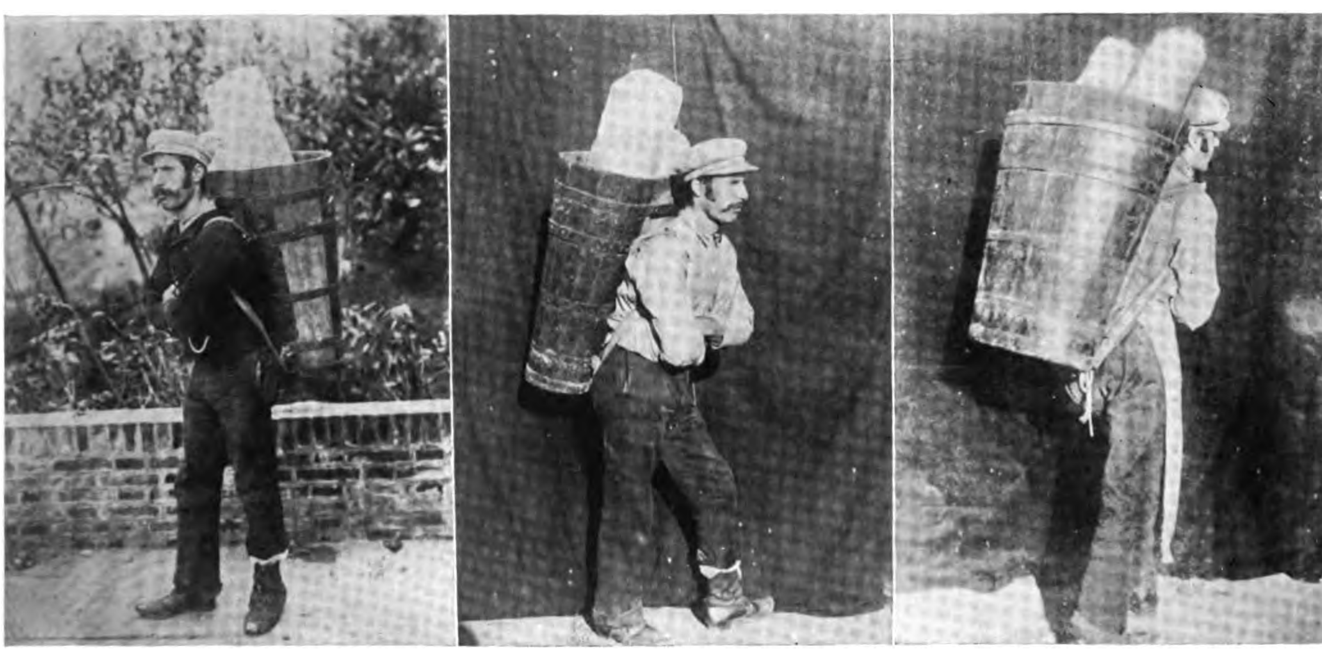
PROMPT DELIVERY.

And giving them the NUMBER of POUNDS they order. Do not have to borrow ice from my competitor. Have loaned him ice in the past to supply his customers, and in the future will have plenty to supply all with.

SELL FOR CASH OR CREDIT.

Old Tom and Jim Harris are in charge of wagons. Tickets to be had at low rate.

——Guam, the coaling station of the United States in the Ladrone islands, is to be provided with an ice making and refrigerating machine. There is no potable water on the island, and the members of the small American colony there are obliged to drink the condensed steam from the boilers. The York Manufacturing Co., of York, Pa., has constructed a plant with a capacity of two tons of ice, besides refrigerating capacity, the machinery weighing about ten tons. It is to be shipped via Suez canal, but will not reach its destination until next spring.



ICE DELIVERY IN VENICE, ITALY—HOW'D YOU LIKE TO BE THIS ICE MAN?

[*Written for* ICE AND REFRIGERATION.]

AN ENGLISH BACON FACTORY.

YORKSHIRE BACON CURING CO.'S PLANT—LOCATION OF FACTORY—CAPACITY OF PLANT—CONSTRUCTION AND EQUIPMENT—VIEWS AND OUTLINE SKETCH OF PLANT.

THE town of Selby, England, is situated in the West Riding of Yorkshire, and is well known as the junction where many of the great trunk railways of England converge. It is pleasantly situated on the right bank of the river Ouse, in the midst of a large agricultural area, for which it also forms the center. There are only some 6,000 odd inhabitants, but it occupies the center of a large, densely populated area, containing six millions of people. If you conceive an equilateral triangle of which the apex is York, and Leeds the angle on the left, then Selby occupies the position of the right angle.

Selby is typical of many hundreds of towns in England, inasmuch as it is the market place for the whole district around, and in that capacity becomes busy about once a week, when the farmers flock there to sell the produce of their lands.

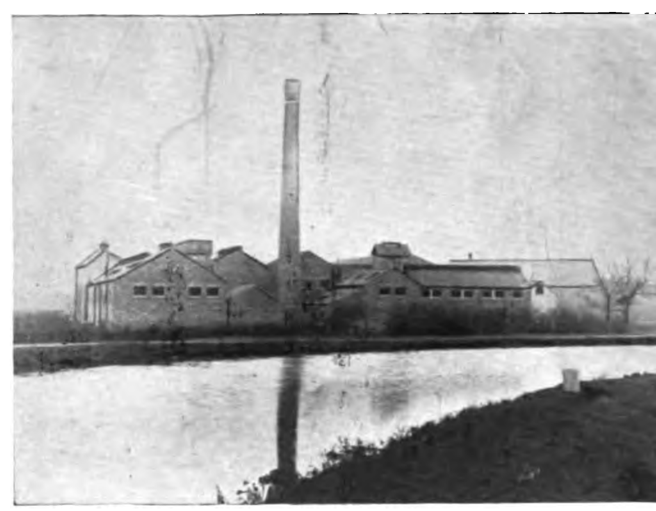
Among its institutions is, of course, a farmers' club. This club is progressive, if anything, and composed of Yorkshire "tykes" with a keen eye to anything likely to improve the value of their produce. Hence it came about that when it was suggested some year and a half ago, that the town seemed an ideal situation for a bacon factory, the matter was taken up with great enthusiasm, as every farmer saw prospective "Yorkshire bacon" in great quantities being distributed over England to the accompaniment of many exclamations of astonishment that no one had thought of sending it before. This is a curious fact: Yorkshire bacon and York hams are met with all over the United Kingdom, but neither York nor Yorkshire has ever known them. Some come from the far west—from the United States—some from Canada, and some from Ireland, nearer at home, but few, if any, out of the country itself. The farming community set themselves, therefore, to put matters right, and led by Captain Henry Liversidge, J. P. (who ultimately became chairman of the company), the idea was duly discussed and it was agreed to go on with the undertaking. At this stage, perhaps no man took greater interest or worked harder for the proposed undertaking than Mr. H. L. Chowan, the well known agent of the earl of Londesborough, and he not only succeeded in persuading his lordship to take a lively interest in the matter, but was instrumental in providing a suitable site on his lordship's land at a small cost.

The company was duly formed with a capital of £35,000 ($175,000), and the directors at once engaged the services of Messrs. William Douglas & Sons, Ltd., of 29 Farringdon road, London, England, the well known bacon factory architects and engineers, whose designs were carried out, and who supplied the entire mechanical equipment.

The factory has been working some little time, and would be doing good work, but for the fact that the board of agriculture have detected swine fever (!) in a solitary unfortunate swine at Leeds, and for that reason have proscribed the whole area in which the factory is situated. That temporary aberration of the esteemed board of agriculture will doubtless pass, and the place get to work in real earnest.

The capacity of the place is about 1,500 hogs per week, and the details of its construction, as characteristic of the modern English bacon factory, are of interest. There are no great packing houses in England comparable to those of the United States and Canada, but a set-off to that lies in the fact that native cured meats in England bring a higher price than those of all comers, and about 50 per cent greater prices than the exports, for example, of the United States. The accompanying illustrations were made especially for ICE AND REFRIGERATION from photographs and original sketches furnished by the architects of the plant.

YORKSHIRE BACON CURING CO., ENGLAND—NEW FACTORY.



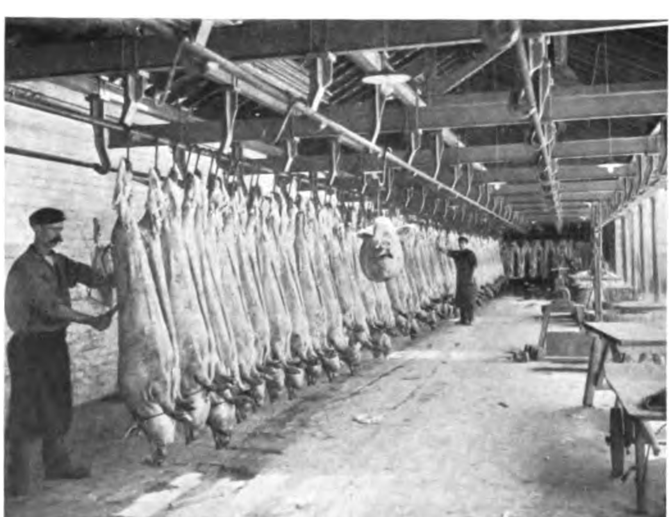
YORKSHIRE BACON CURING CO.—REAR VIEW OF FACTORY.

The factory is designed in the form of a hollow square. The styes lie along the outside of the double walls surrounding the cellars, and lead up to the slaughtering pen. There is accommodation for 500 pigs at one time, a greater number being undesirable, owing to the restrictions against keeping them more than four days. The sticking pen is fitted with a power hoist which swiftly elevates the hogs, and they are dispatched and thrust into the bleeding passage, from whence they emerge and are dropped on to the dumping table of the scalding tank. The leg chains by which they have been hoisted are at once removed, and they are rolled into the scalding vat, where at a sufficient temperature they are scalded so that the hair comes off easily. As soon as it becomes apparent

that the hair can be easily removed, they are lifted by the "cradle" on to the scuttling table, and the greater portion of the hair removed. A gob hook is then fastened into the apex of the lower jaw, and they are slid down an oblique board from the scuttling table on to the track bar, and they are stopped beneath the opening of the singeing stack. Through a grisset of white flame the hogs are hoisted and lowered at the rate of some two per minute if necessary, and are again dropped on to the track bar, where they are submitted

SCUTTLING TABLE AND SINGEING FURNACE.

to a cold douche bath while they are scraped clean. They are then disemboweled and the intestines are sent to the assorting and casing cleaning room, on the one hand, and the pigs with flake lard laid on the hook, and head and feet attached, are sent along the bars of hanging house to cool. Here they hang for a few hours—four to six, according to the weather—and after being weighed they are further dissected. The



HANGING HOUSE—YORKSHIRE BACON CURING CO., LTD.

head and feet are removed and the vertical column taken out. This leaves only sides, which are then run along the return track bar and into the chill rooms.

These chill rooms are two in number, and lie parallel the one to the other, and have a united capacity of 13,000 cubic feet. The system of chilling is in duplicate, with circulated cold air and shallow brine walls, the object being to first remove the animal heat, then allow the further complete cooling to be performed by the shallow brine walls referred to.

From the chill rooms to the cellars the entrance is direct. There are two cellars of equal size and with a total capacity of about 25,000 cubic feet. The system of cooling is by circulation of brine through 4-inch C I pipes, at 12-inch centers. A cellar should always have a certain amount of humidity, especially over the meats, hence the air must be maintained at nearly constant temperature and moisture. All the

PACKING LOFT FOR SMOKED BACON.

chilling must be done in the chill rooms, and the meat should never leave them until it registers 38° F. on the gammon end.

The cure of bacon usually extends over ten days for mild cured, and "any time you like" for "hard" cured. This latter bacon is warranted to create a thirst which will require much quenching.

The cure of hams is a very delicate process, and

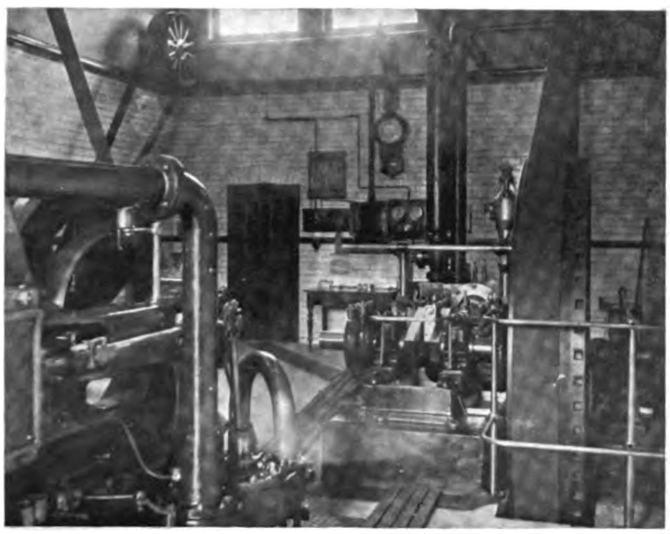
HANGING ROOM FOR HAMS AND SMOKE STOVE DOORS.

lasts about one day for each pound weight for mild cured hams, and two days for each pound weight for hams to be kept to "mature." Maturing consists of keeping the hams until they develop a fine crop of blue mold. The temperatures maintained are 38° F. in chill rooms and 42° F. in cellars.

Practically the factory exists for ham and bacon curing, but there are other departments which have developed already amazingly, and to all appearance

are likely to figure largely in the future prosperity of the concern. These are the sausage room, pie room and bake house. There are, of course, lard rooms and smoke houses also, and all the various auxiliary departments necessary to the complete design of such a place.

The mechanical equipment consists of two horizontal steel boilers of thirty horse power each, to work at 100 pounds pressure, with feed pumps in duplicate.



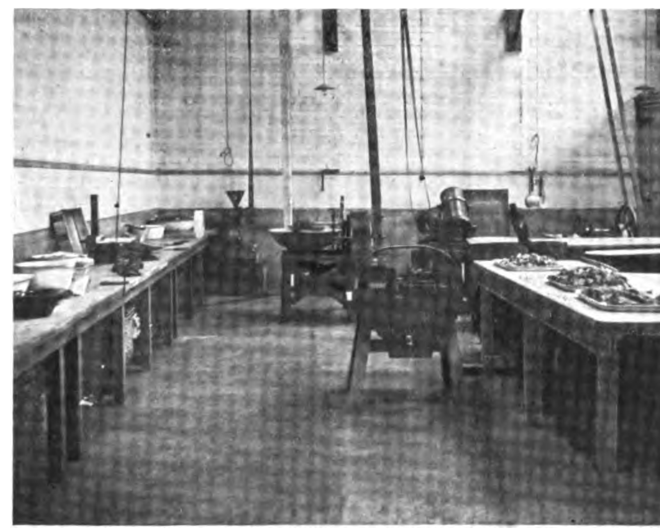
ENGINE ROOM—YORKSHIRE BACON CURING CO., ENGLAND.

The main engine in engine room is a 25-horse power horizontal type, non-condensing.

The refrigerating machinery consists of a carbonic anhydride duplex type refrigerating machine, furnished by J. & E. Hall, Ltd., of 23 St. Swithin's Lane, London, E. C., and it is fitted with a compound jet condensing steam engine air pump and feed pump. There are two compressors, each being coupled in such a manner that it can be uncoupled in a few min-

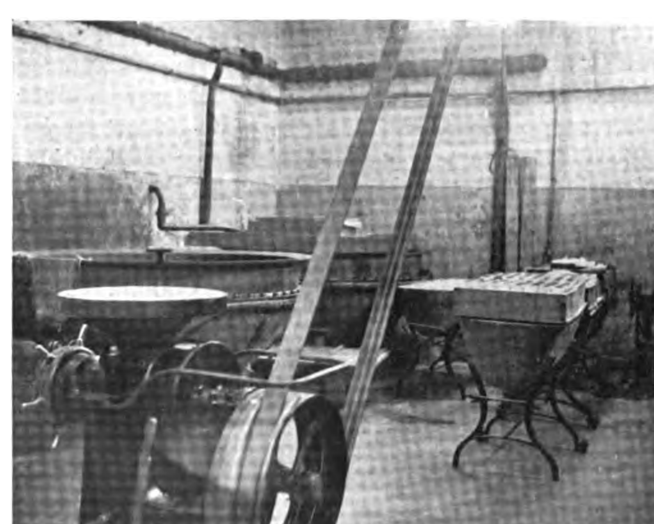
REFRIGERATING MACHINE—YORKSHIRE BACON CURING CO.

utes, so that either compressor can be worked by itself. The crank shaft carries, in addition to the fly wheel, fitted with barring gear, a pulley for driving the countershaft. From the countershaft is driven the centrifugal pump used for circulating the brine, and also a Sturtevant air propeller, which is attached to an air "cooler." This cooler consists of about 500 feet run of 1¼-inch piping, thoroughly insulated and divided by a diaphragm in the center. The air of the chill rooms is circulated over this piping and returned to the rooms. The compressors deliver into two carbonic anhydride condensers, each condenser being separate and capable of being worked independently of the other. There are two evaporators, independent of each other also, and they have their own regulating valves and pipes from the condensers and the compressors. There is a centrifugal pump of large dimensions for circulating the brine throughout the



SAUSAGE ROOM—THE YORKSHIRE BACON CURING CO., LTD.

system, and it is arranged to deliver into either evaporator, so that either can be used independently. The fittings in the chill rooms and the cellars have already been described, but it may be useful to indicate here that much importance is attached by the engineers to insulation. The chill rooms are insulated with seven inches of silicate cotton throughout, as is also the ceiling of the cellars. The walls of the latter are hollow, and this is deemed sufficient.



LARD ROOM—YORKSHIRE BACON CURING CO., LTD.

Part of the mechanical equipment consists of a 100-light dynamo and battery of accumulators. There are a great many various machines in use in the various departments. In the lard room are the fat cutting, rendering and cold lard filling machines, etc. In the sausage room are great power cutters and fillers and other special machines. In the pie room are many and various appliances necessary for the production of a large number of pork pies. The smoke stoves are

models of modern design, and can be regulated to a nicety both in heat and smoke. One feature of the factory also is a chemical laboratory, perhaps the first of any consequence ever equipped in England for a bacon factory.

There are many features of the factory peculiarly English; a fact, however, which renders it all the more interesting from the point of view of those not conversant with the methods in use in the mother country. Taken altogether, it is said to be one of the best plants in Europe. It is entirely modern, and, so far as factories in Great Britain go, fairly large.

[*Abstracted from* TRANSACTIONS OF THE A. S. M. E.]

PATENTS.

PRELIMINARY EXAMINATIONS ADVISABLE—CAVEATS—APPLICATIONS—GOVERNMENT DEFENSE OF PATENTS—COPIES OF PATENTS—SUGGESTIONS OF VALUE TO OUR READERS.

By JAMES W. LEE,
MEMBER OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

(*Concluded from Page 401, December Issue.*)

GOVERNMENT DEFENSE OF PATENTS.

MANY patentees complain that the government grants them patents and then forces on them the burden of maintaining them; that government courts often declare the patents weak or void; and they think the government should sustain its grants.

This view ignores the fact that the government, in making the grant, can only act on the facts before it. The inventor makes oath that he is the original and sole inventor. It may turn out that the oath is false, and that the invention was gotten complete from the actual inventor and patented with his consent. The government should not be called on to uphold any such patent. Again, the government experts search prior patents and the literature of the art, and use their own personal knowledge, and, finding nothing of an anticipating character, the patent is granted. The government has made $15 worth of searches, and the inventor appears to be entitled to his patent, and the patent is accordingly granted. But the government has no possible means of knowing of unpatented prior public uses. You may invent a peculiar steam engine, and build and sell them for ten years. Some man, 1,000 miles from you, invents the same thing and very properly gets a patent on it, the government having no knowledge whatever of your past efforts. That patent must fall, and the government should not be asked to uphold it.

Again, an inventor applies for his patent, and the commissioner rejects him on some old patent which appears to be of anticipating character. Thereupon the inventor files a sophistical argument as to the construction and action of the alleged anticipation, and the examiner, half convinced and resolving doubts in favor of the applicant, allows the application, and the patent is issued. Later, when the patent is taken into court, daylight is let into the sophistry of the argument, and it is shown that the old device is the same as the new device. The new patent must fall.

COPIES OF PATENTS.

The government has printed copies of almost all its issued patents, and manufacturers and others having to do with patents should more fully avail themselves of this fact. They would do well, if much concerned with patents, to have volumes containing copies of those of interest. The patent office divides inventions into something over 200 classes, and these classes are again divided into sub-classes on more or less rational lines. There are over 6,000 of these sub-classes. The patent office will furnish free on application a classification list. Copies of single patents may be purchased for five cents each; if a complete sub-class is taken, for three cents each; if a complete class is taken, two cents each. Any person can procure these copies from the patent office at the above figures. The patent attorney would necessarily charge for services in ordering, or for any necessary service. The patent office will also enter subscriptions for the mailing of such patents as may issue from time to time in a selected sub-class, a small deposit being made and renewed to cover the cost at five cents each.

DIGESTS.

Over 600,000 United States patents have been issued, and it is unfortunate that the patent office has thus far not been able to procure appropriations for digesting them somewhat as the British patent office has partially done with its comparatively small number of patents. Such digests of United States patents as have thus far been published are the result of individual enterprise, and the works are necessarily expensive, owing to the great labor and the very limited demand. Manufacturers interested in specific lines of inventions would do well to avail themselves of such digests so far as suitable to their purposes. These digests have been the outgrowth of special activity in certain lines of industry at certain times. I have never seen a complete list of these digests, and do not know that one could be made.

FOREIGN PATENTS.

Good foreign patents are extremely valuable property, but it does not follow that all foreign patents are of value. Not one in a hundred of American inventions, even if they are somewhat profitable, are worth the cost and trouble of foreign patents. The cost of foreign patents is heavy, and in most cases the continued validity of the patents is contingent on the payment of taxes and the local working of the invention. If a customer is promptly found under the foreign patent, then its taxes and working offer few difficulties: but if no customer is found within a year it becomes a serious matter to perform the legal working. Little or no confidence should be placed in nominal or paper workings, and even these are expensive. In some countries taxes begin, and the invention must be worked at the end of the first year, and the working must not permanently cease; and in the case of Canada the continued validity of the patent restricts the power to import the invention into Canada. An invention which has made good profit in America and is a matter of foreign requirement, is well worth foreign patents, and the customer may often be found, in view of the American success. But the trouble is that the foreign patenting cannot be delayed until American success determines its expediency. In some foreign countries the patent would be rendered void by prior patenting or disclosure, and in America the patent expires with the term of the first expiring previously granted

foreign patent. Hence, to avoid any antedating, all the patents should bear about even date. Date can be made for foreign patents by merely filing the ap plications, while in America the date of patent is the date of grant, and may be months, or even years, after the date of application. Hence the proper course is to take no steps regarding foreign patents till the United States application is allowed. Then select the proper future issue day for the United States patent, and cause all the foreign applications to be filed on that day. An exception is to be made in case the invention goes into public use before the issue of the United States patent. In such case the shortening of the life of the United States patent must be submitted to, and the foreign patents should be taken out before public disclosures would render them void.

In most foreign countries patents are granted as a matter of course, without examination into novelty, and the grant of the patent is no evidence whatever that the patent is good for anything. In Germany applications are examined, and generally rejected. The merit which will insure the grant of a German patent is not at all to be measured by American standards.

Briefly, then, waste no money on foreign patents unless prompt results are in sight, or unless the invention is of importance enough to justify the expense and trouble due to recurring taxes and legal local working of the invention; foreign patents should antedate invalidating disclosures of the invention; it is desirable that all patents on the same invention bear even date. This latter can be secured by filing the foreign patents in the interval between allowance and grant of the United States patent.

LEGAL MATTERS.

Legal Decisions of Interest to the Ice and Cold Storage Trades, Specially Reported for Ice and Refrigeration, by J. L. Rosenberger, LL.B., of the Chicago Bar.

DAMAGES FOR ICE DETAINED.

IN the spring one ice company purchased of another an ice house. It also received a bill of sale, in general terms, of personal property, which might have sufficed to transfer any ice stored in that ice house. But, the winter previous, third parties had cut and stored in the ice house, under the authority of a renting, partly verbal and partly by letter, a quantity of ice, as to which transaction the company purchasing the ice house had no knowledge. In June, learning that these parties were about to remove the ice, this company applied to one of them for information as to their rights, and demanded that he exhibit his lease, which was refused, with the assertion, according to some of the testimony, that he had a lease at hand, but was under no obligation to exhibit it. Thereupon the company interrupted the removal of the ice, put a custodian in charge thereof, and notified the parties that they could not remove the ice unless they exhibited a lease. They, however, made no attempt to convince the company of their rights, but brought an action of replevin for possession of the property. The action was tried in January following, by which time the ice, originally approximating 1,700 or 1,800 tons, had melted away so that there only remained a pile amounting to about forty tons. A few days before the trial the company had satisfied itself, from other sources, of the plaintiffs' ownership, and conceded same on the trial. Under instructions from the court, the jury found for the plaintiffs the value of the ice at the time of its seizure by the company, which it fixed at $1,275, with nominal damages for detention, and also found exemplary damages in the sum of $2,000.

Appeal was taken to the Supreme court of Wisconsin. The latter holds, however, that the judgment may stand, if the amount of the exemplary damages be remitted; otherwise, to stand reversed. *Findlay and Others* vs. *Knickerbocker Ice Co.*, 80 Northwestern Reporter, 436.

The Supreme court holds that the taking by the defendant company was unquestionably wrongful, and constituted a conversion, if the plaintiffs had chosen so to treat it. That being so, the rule of damages was settled. The plaintiff is entitled to recover, when he cannot obtain his property, its value at the time of the taking, and interest therefrom, with damages for detention.

The property in question, for all practical purposes, the court insists, was non-existent at the time of trial. It is obvious at once, it says, that the 40-ton residuum left by the melting away of the original 1,800 tons was no longer ice in merchantable form. It had, of course, lost its shape and identity as merchandise, and become a conglomerate mass, merely an incumbrance of the space it occupied, not worth the cost of removal. Delivery of the property claimed, or any part thereof, in substantially its original condition, could, therefore, not be had. Hence the application of the rule stated.

In the state of doubt, however, which it was established existed in the minds of the officers of the company as to the ownership of the ice—as to whether it was transferred to the company by the somewhat general bill of sale, or whether it was property belonging to the sellers of the ice house, and to whom the purchasing company might have owed some duty of reasonably careful custody—the Supreme court holds that the company was certainly justified in demanding from entire strangers seeking to remove the ice from the premises some evidence of their right thereto, and the conduct of the one of the plaintiffs, upon that request being made, in refusing to furnish any such evidence, although he might easily have done so, well tended to increase the company's hesitancy in surrendering to him. Under these circumstances, and the absence of any evidence of any wrong motive, malice, or wantonness in the withholding of the property, it is that the court holds that the jury should not have been allowed to enter that almost limitless field of speculation as to motives, and punishment therefor, involved in the allowance of punitory damages, or smart money, and that the submission of that question, as also of the refusal of the trial judge to set aside the verdict thereon, was error.

——The large ice house of the Spring Lake Ice Co., at Spring Lake, Mich., two miles north of Grand Rapids, in which Barry Bros., of Chicago, are largely interested, was totally destroyed by fire December 24, together with some 70,000 tons of ice of last year's cut, which it contained. The loss is given as over $100,000.

[*Written for* Ice and Refrigeration.]

DIFFERENTIAL HOIST FOR LOW STRUCTURES.

ADVANTAGE OF AIR HOIST IN ICE FACTORIES—HOW INCONVENIENCE OF BUILDING MAY BE OVERCOME—CONSTRUCTION OF DIFFERENTIAL HOIST—SKETCH OF HOIST.

By J. A. Mermilliod.

SINCE the air hoist has come into use in many ice factories, other people would have adopted this advantageous method of pulling ice out of the freezing tanks, if their buildings would have permitted, especially where large cans of three or four hundred pounds are being operated.

I will prove by the accompanying illustration that this inconvenience of the building can easily be overcome, and will let the readers of Ice and Refrigeration judge for themselves of the practicable plan of hoisting a 54-inch ice can out of the bath into the dump tub with a 40-inch hoisting cylinder by the differential hoist system.

There are to-day many factories using 300 and 400-pound cans with just enough space under the roof to allow the traveling of the crane, and requiring two men to hoist the output of a machine of thirty-five to fifty tons daily capacity.

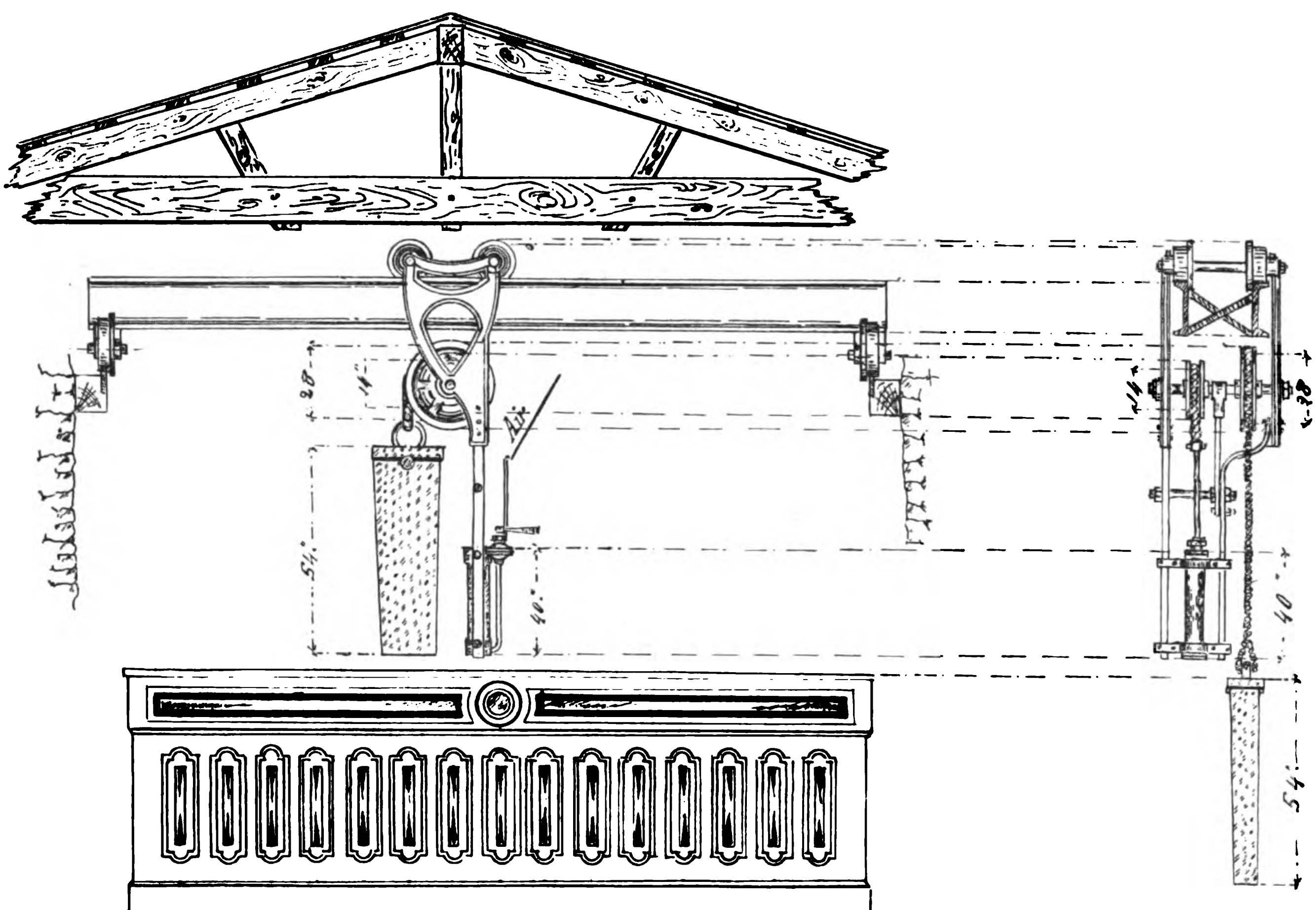
Take as a basis an ice factory consisting of three machines of thirty-five tons each, of which the cans are fifty-four inches, or 400 pounds, in two machines, and 200 pounds in the other. When pulling at the full capacity, which is always done in the summer months, the output is from 105 to 125 tons per day, and it requires two men on each freezing tank of each machine. These men are employed at not less than $10 per week, which makes $60 per week for ice pulling.

By an investigation of the hand hoist it will be seen that most of the time is lost in the act of hoisting the full can out and tripping it back to its place to be filled. This is very evident when it is remembered that one of these cans weighs over fifty pounds. The accompanying sketch will explain where this differential hoist can be substituted for the hand hoist, using the crane already in the building and doing away with the reel, gears, chains and hand crank wheel.

Parties interested will naturally consider first the cost of putting in the differential hoist. The cost of this will be very small, as there is nothing expensive about its construction. There is also a great saving of labor, for with its aid one man can do exactly the same work it now takes two men to do without it, thus reducing the labor $30 per week.

Explaining the construction, I will begin with the main thing, the cylinder. This should be made of brass tubing, seven inches in diameter, forty inches long. Common steam pipe could be used, but brass tubing is much better, on account of its smooth inside bore, which preserves the leather crimps of the piston longer.

This 7-inch cylinder, reduced to six inches, one inch being deducted for the area of the piston rod, which is on the pulling down side raising the full can, will equalize an aggregate weight of 2,520 pounds, with ninety pounds per square inch on the 6-inch piston; but, as it is of a differential nature, the pulling lever is the shortest, being the nearest to the fulcrum. It will be noticed in the sketch that the piston is working on a 14-inch pulley or a 7-inch lever, while the pulley lifting the ice can is twenty-eight inches or 14-inch lever, and consequently is double the leverage.

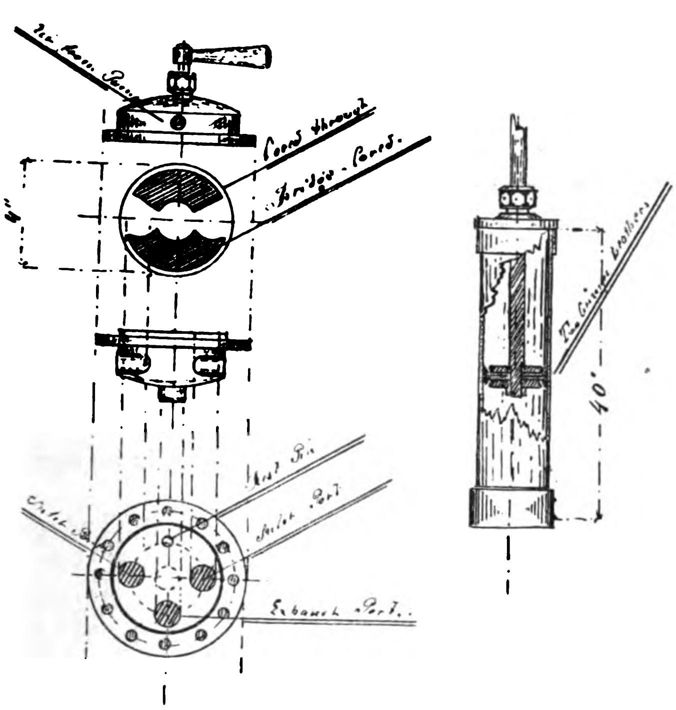


DIFFERENTIAL HOIST ADAPTED FOR USE IN ICE FACTORIES.

If both levers were of equal length, the equalization would be the same; but, as it is, it requires double the pressure on the 14-inch pulley to equalize the twenty-eight; hence the 2,520 pounds pressure on the 6-inch piston will equalize 2,520 divided by 2, or 1,260 pounds, on the 28-inch pulley, which is exactly three times the weight of a 400-pound can of ice plus the weight of the can with ninety pounds of air to work the hoist. To make the piston tight two leather crimps are used, with the evasive part up for the pulling-down side, and the other down for the pulling-up side, as shown in the detailed sketch of the cylinder and piston. In packing the piston rod a small crimp covered with two or three washers is preferable to the spiral packing, as the crimp packing reduces the friction on the rod.

To make the cylinder secure on its mountings, which are made of 5/8×2½-inch iron, two pairs of ¼×2-inch clamps are used, with ends fitting in the side slots of the mountings.

Coming to the construction of the valve actuating



the hoist, the seat is made of cast iron, with the valve made of brass, four inches in diameter, and of the quarter port pattern, as illustrated. The valve, which on the drawing is underneath the valve cover, is on the air inlet side cored through, to allow the pressure on the valve and keep it from leaking, while the air exhausting on both sides of the cylinder into the atmosphere, goes through a bridge cored cavity in the valve. When one port admits the air in one end of the cylinder the other exhausts, and *vice versa*.

As to the speed of the hoist, the inlet or outlet ports can be choked to suit the speed of the piston. The most available compressor needed for this work is the New York air brake, 10-inch standard pump, with pressure governor attached, made of the duplex type, which is simple and durable.

Readers, if you want to be economical and up with the times, bring forth your critics and work on the differential hoist.

[*Translated from the* Zeitschrift fuer die gesammte Kaelte-Industrie.]

THE REFRIGERATION OF DWELLINGS.

INVESTIGATIONS OF DATA REGARDING THE REFRIGERATION OF DWELLINGS—A PRIMITIVE METHOD—IS DWELLING HOUSE REFRIGERATION PRACTICABLE AND PROFITABLE?

By Professor E. Brueckner, of Munich.

(*Continued from Page 306, December Issue.*)

[*Synopsis of Foregoing Part.*—The history in the development of the refrigerating industry is a confirmation of the experience in other branches of mechanics, viz., that they are subject to changes in their original object. The original object of the first inventors of refrigerating devices was the cooling of dwellings, hospitals, etc., but the successful application of the machines was afterward directed in other channels. The failure of these first inventors largely due to their adherence to the idea of a cold air machine based upon the use of dry air, whereas the air obtainable is saturated with moisture. It was only on the introduction of the use of other gases, such as CO_2 and NH_3 that success began to crown their efforts. Nevertheless, in spite of repeated failures the efforts in behalf of improvements in cold air refrigeration have been repeated up to the very present.]

WHEN, some time ago, I was honored with the request, on the part of the executive committee, to deliver a lecture on the subject of the utilization of refrigerating machines for the ventilation of dwellings, I assumed the task willingly and with a degree of confidence, expecting to reap from my studies of the writings dealing with the subject, and from my direct researches on practical lines, a satisfactory harvest of positive material, or, in other words, information as to the results obtained by the actual operation of plants of the kind under consideration. As a matter of fact, I only knew of one such plant in actual operation at that time, but of a number of projects on a larger or smaller scale, which, to my sorrow, I had no opportunity of following to their completion. I am compelled to state in advance that, in my investigations as to the fate of these projects, I have met with one disappointment after another, for they all have changed from promising enterprises into failures, *i. e.*, they all have been placed "on file." In view of this fact, the question arises: Must not any attempt to effect the cooling of dwellings by means of machinery be considered a failure in the premises, when development seems to be an impossibility, even in our time, that has witnessed the growth and success of mechanical ideas of a much less promising nature? It cannot be claimed that a greater want of mankind is relieved by providing skating on ice in midsummer for the lovers of this sport, than by providing a moderate medium temperature pleasant and healthful to the human body, in winter as well as in summer, either by mechanical warming, or by mechanical cooling of the air in living rooms. The first named task, that of the heating of dwellings, is certainly the more important one, which accounts for the fact that the system of central heating has already been brought to such a degree of perfection that further material improvements are hardly to be expected. Every midsummer, even in our moderate climate--how much more in southern countries—gives birth to the ardent desire for relief from the oppressive heat, a desire the realization of which is very generally regarded as an impossibility; but where certain climatic peculiarities offer an opportunity, there is no hesitancy in utilizing the same, so as to effect by natural means the greatest possible cooling of dwellings. In the city of Freiburg, grand duchy of Baden, for instance, the people take advantage of the cold wind blowing from the direction of the "Hoellenthal" (Valley of Hell) at certain hours

of the evening with great regularity. By a timely opening and closing of their windows they catch the wind as in a trap, and in that manner succeed in cooling their dwellings. The people of Freiburg look upon this simple method of refrigeration provided by nature as a great blessing, and there is hardly anybody who would not like to share in the same, were it not for our innate modesty that looks upon intolerable heat as an unavoidable evil to which we must submit, differing in that respect from the severe cold against which our remote ancestors already understood how to effectually protect themselves. Aye, the spirit of contrariness which pervades the great majority of mankind, tends to the desire for a temperature of 59° F. in midsummer, but one of 72° F. in winter.

Though recognizing the fact, as before stated, that the methods for bringing about such results by mechanical means have not been advanced effectually, I have the conviction—and in the interests of industry, the wish—that we shall cast aside this modesty more and more, and that we will know how to provide our dwellings at least with an equable temperature of air in summer and in winter. For a number of years past the refrigerating machines have been developed to such a state of perfection that the further expansion of their rapidly growing field of application in the direction of the cooling of dwellings appears but a small step.

In taking this step two objections have to be met:

First.—Is the task of reducing the temperature of the air in our dwellings by means of refrigerating machines in midsummer a mechanical possibility, without engendering an unhealthful degree of moisture?

Second.—Can the mechanical possibility be combined with the desired profitable operation?

I shall endeavor to explain these two questions.

For the production of artificial refrigeration on a large scale the compression machines are at present alone in use, having amply proven their superiority over the older absorption machines, more particularly since their perfection through the inventions and labor of Prof. Dr. Von Linde, dating from the middle of the seventies. As a reminder of the operation of the compression refrigerating machines, I beg to make use of the following illustration from elementary nature.

In our researches into the operations of nature, not easy of observation through the senses, we are in the habit of resorting to auxiliary illustrations, and for comparative illustration water is used most extensively. Processes in physics, electricity, heat, etc., we like to illustrate by analogies from hydraulics. It is less difficult for us to operate with a supposed volume of water than of heat. In order to remove a volume of water poured upon a floor, which is unable to find an exit by natural flow, we are not at a loss for a proper means. We use a porous medium, a sponge, for instance, by compressing it and allowing it to expand and draw in the water, then compressing it again into some drain. This picture seems to me a most drastic illustration of the process in the compression refrigerating machine: In place of a sponge we have here a compressible medium, susceptible of resorption of heat, a gas or a vapor. These bodies, in their expansion, absorb heat from their surroundings, provided they are in condition to do so, *i. e.*, are colder than their surroundings; during or after the compression they transfer the heat to any proper surrounding medium, provided they are here met by a natural fall of temperature. We are therefore in a position to make such body, by alternate compression and expansion, a conveyance for heat in the same sense in which the sponge may be used as a conveyance for water. The manner of representing the said process in the diagram of heat allows of our immediate recognition of those changes of condition which we must combine into one cycle of operation in order to reduce to a minimum, within given limits of temperature, the heat expended for a heat motor, and the compression work expended for a refrigerating machine. When we carry out such a cycle representing a rectangle in the diagram of heat, and formed—

1, by an adiabatic compression;
2, by an isothermic expansion;
3, by an adiabatic expansion;
4, by an isothermic compression,

we arrive at the efficiency which

(*a*) for the motor equals

$$\frac{\text{Work done}}{\text{Heat expended}} \text{ or } \frac{T^1 - T^2}{T}$$

(*f*) for the refrigerating machine, available refrigeration equals

$$\frac{\text{Heat carried off}}{\text{Work}} \text{ or } \frac{T^2}{T^1 - T^2}$$

Not all media are equally well qualified for the execution of this theoretically perfect process. With so called permanent gases (air) it cannot be accomplished by nearly as simple means nor so close to perfection, as with vapor, which accounts for the complete surrender of the cold air machine in its competition with the cold gas machine.

Among the different kinds of gases at all adapted for this process, there are three that deserve to be especially mentioned, to wit, carbonic acid (CO_2) ammonia (NH_3) and sulphurous acid (SO_2). The last named, sulphurous acid, is not considered as entirely the equal of the other two; and of the others, ammonia, according to the opinion of the most noted experts, takes the palm. Particularly for the object named, the ammonia compression machine offers better safeguards against accidents endangering life and health, owing to the fact that any escape of gas, through leakage or other defects, becomes at once noticeable to the organs of smell, while there is no such danger signal in the case of the more dangerous carbonic acid. The odor of escaping ammonia gas is strong enough to awake a person from deep slumber before the concentration of the gas floating in the air can have a dangerous effect upon the respiratory organs; while carbonic acid will suffocate a sleeping person. The expenditure of motive power for carbonic acid machines is furthermore greater than for machines working with ammonia, whenever a saving of the cooling water is required, and as a rule, this will be the case with reference to plants in private dwellings receiving their water supply from the municipal water works, the cost of water from this source creating a desire for economy in its use.

The process in a refrigerating machine of this kind is as follows: NH_3 is condensed in the compression cylinder, and thereby raised to a temperature higher than that of the available cooling water, in the condenser this stored heat is transferred to the cooling medium (water or atmospheric air or both) and carried off. Through this discharge of heat NH_3, under constant pressures, becomes liquid, and then enters through the proper opening, the regulating valve, into an apparatus formed of coiled pipes, with lessened pressure and correspondingly low temperature. In this condition it is prepared to take up heat from the medium surrounding the coils, being relieved of the same again, after suction into the compressor and condensation into the condenser, by the cooling water.

The evaporator takes varying forms, according to the object in view. For the cooling of air it seems to be proper in the first place to let the air to be cooled play around the evaporator coils, which is accomplished by direct air coolers. In America these are chiefly in use for brewery and all other possible refrigerating purposes, while in Europe the indirect air coolers are almost exclusively in use. These consist of an apparatus in which a solution of salt of about 1.7 specific gravity, and difficult to freeze, is first cooled by the expanding NH_3 gas, and is then by means of pumps conducted into other systems of pipes by which the cold is transmitted to the air. Our happy choice of the indirect air cooling is well founded, for the reason that it insures greater equality in the operation and better regulation and distribution of the refrigerating current. According to the temperature which is to be imparted to the air, smooth or ribbed pipes are used as refrigerating bodies. The last named can be used only for temperatures above 32° F., because lower temperatures would cause the formation of frost or ice, filling the space between the ribs, and considerably reducing the effective refrigerating surface. For our purpose ribbed pipes are best adapted.

While the highest possible concentration of all parts and appliances is desirable for refrigerating plants serving industrial purposes, this is, for various reasons, not advisable in dwelling house refrigeration.

Motors as well as compressors cause noise and slight vibrations, which, though these may be reduced, will eventually prove as inconvenient to the people for whose benefit the plant is operated, as the heat which it is intended to alleviate. For that reason the moving parts of the plant must be placed at a distance from the dwelling proper. They should be located in the cellar, or, better still, in a separate building, if possible. This would at the same time prevent all inconvenience to the residents resulting from the accidental, or in connection with certain manipulations, the not always altogether avoidable, escape of NH_3 with its penetrating odor. Sensitive people might easily be led into a total disregard for all the benefits of refrigeration by one strong sniff of escaping ammonia. While the placing of the machinery thus appears to be a question of convenience only, the proper arrangement of the air cooling apparatus is determined by mechanical and hygienic requirements.

If the air cooling apparatus is stationed in the dwelling rooms proper, there will be one objection which is frequently urged against the whole scheme of mechanical refrigeration of dwellings, but which may, however, be overcome without trouble, to wit: a considerable quantity of moisture in the cooled air. It would, of course, be necessary to attach the refrigerating systems at the upper sides of the room walls, in order to effect a natural circulation of the air; the warm air in the process of cooling would become saturated and in descending would leave behind a considerable deposit of moisture on the refrigerating bodies; the constant dripping from these bodies, as well as the direct contact with the moist air, would constitute drawbacks that no simple reduction of temperature could compensate for. The refrigerating bodies may be so arranged, however, that not only these drawbacks would be completely avoided, but that any desired degree of dryness of the air would be obtained. I call attention to the fact that air cooling plants have been constructed for the sole purpose of drying certain materials without roasting them and depriving them of their flavor. Some of the largest German breweries operate extensive air cooling plants for no other work but that of drying the yield of the hop harvest rapidly, and with the smallest possible loss of flavor. In these plants air is cooled to a low degree, and a great part of its moisture thereby extracted, which forms a deposit of frost on the evaporator coils. Though the air, when leaving the apparatus, is saturated with moisture, when it comes in contact with the warmer air in the hops storerooms and with the hops itself, it becomes to a high degree resorbent for moisture; with rising temperature it absorbs more and more moisture, which is eliminated upon the return of the air to the evaporator coils, remaining a deposit on the latter. The cooling of the air for dwelling rooms is an analogous process. In a separate room, which must be located above the dwelling rooms, the air cooler is placed, isolated as completely as possible. The fresh air enters the same through channels carried over the roof, becomes saturated and discharges its excess of moisture on the coils. Saturated and sharply cooled, it descends by means of proper air shafts into the inhabited rooms below, absorbs from the air there heat and, at the same time, moisture, and thus acts as a cooling and drying agent. The air consumed is, of course, not returned to the air cooler, as it is in the apparatus for the drying of fruit, but is expelled and replaced by fresh warm air, drawn in by suction and submitted to the same process. As a means of conveying the air, the difference in temperature of the warm and the cold air is sufficient for smaller quantities, such as required in the case of dwelling houses; but for larger industrial establishments conveyance by means of a ventilator is required, as experience in the refrigeration of packing houses has proven. In that case it is even desirable to use two ventilators, one to supply the fresh outside air by suction and force the same through the cooler, while the other serves for circulation, for the rapid exchange of heat and moisture. There is, however, one theoretical disadvantage connected with the mode of operation described: the fact that the air is refrigerated to a lower temperature than is required for its use. The capacity of a refrigerating machine, it must be remembered, is lessened in the same pro-

portion in which, together with the reduction in the temperature and density of the gas serving as refrigerating medium, the heat of evaporation is reduced per unit of volume.

This is, to illustrate, for NH_3 at temperatures of

$t = -13$	about	412	calories	per	cubic	meter.
$t = 5$	"	620	"	"	"	
$t = 23$	"	898	"	"	"	
$t = 32$	"	1,067	"	"	"	
$t = 41$	"	1,258	"	"	"	
$t = 59$	"	1,710	"	"	"	
$t = 77$	"	2,258	"	"	"	

The refrigerating capacity of a given machine would increase with a rise in the temperature of the evaporator. As long as the temperature still permits of a noticeable elimination of moisture, *i. e.*, until near the freezing point, this decrease in efficiency is of no consequence, as against the effect produced, viz., cool and dry air.

A few words concerning the possibility of operating a plant, such as under discussion, with profit. It cannot be denied that this is the weak point which, as a matter of fact, has led to the failure of every project in this direction which has come under my observation. But I trust that the future will work a change in this respect also. With the increasing demands upon the faculties of mankind, especially that class of men employed in mental labor, a corresponding increase in the expenditures for their care and comfort cannot be avoided. It may still be regarded a luxury to provide for artificial relief from the oppressive heat of summer, while provision for heating is considered a necessity in the dwellings of the humblest. The growing development in the provisions for health and comfort will in time justify the appropriation of a reasonable sum for artificial cooling.

The cost of constructing a small plant ready for operation, for the cooling of the principal living and sleeping rooms of a private residence will hardly exceed 20,000 marks ($4,800). Based upon a ten years' loan, the annual expenditures for such a plant are easily determined.

The cost of the motive power is the most important item. In places where electric power is supplied from a central station the annual cost of the power required, three to four horse power for a daily maximum time of ten hours, should not exceed 300 marks ($72). There is no hired help required for the operation of the plant. Lubricating and packing material, salt and ammonia for small plants require so little outlay of money that this can hardly be of any account as against the advantages which I desire to enumerate.

It cannot be doubted that a moderate even temperature of the air in the living rooms is of vast moment to the well being, the health and consequent efficiency of the men of to-day, subject to the demands of the time and in their turn entitled to certain considerations. An interesting plan was prepared last year by the Linde Refrigerating Machine Co., acting upon request of the postal authorities of this city, for the cooling of several of the general operating rooms of the telephone service in the central telegraph office at Munich. The fact that such a plan has been prepared by request is in itself reassuring, and it is to be deplored deeply that the available funds were insufficient for the execution of the work, notwithstanding the very liberal offer made by the company, as the construction of such a plant on a large scale would have certainly contributed materially toward the further development of the industry through the valuable experience acquired.

For the health of the body the easily regulated volume of moisture contained in the air is of incalculable value. Of especial value is the almost complete purification of the air from all dust, and the partial destruction of germs by contact with the frost covered pipe systems which it would be impossible to accomplish in the same degree by any other agency.

(*To be Continued.*)

FIRST OF ITS KIND.

SOMETIME in February next it is expected that the liquid air plant at Los Angeles, Cal., for the Fay Fruit Co. will be completed and ready for operation. Great interest is being taken by the fruit men of the Pacific coast in the outcome of this important experiment. The liquefier for this plant has already been completed, and on the test proved itself capable of producing twelve gallons of liquid air per hour, although the specified capacity was but five gallons. It is said that the annual shipment of fruit from Los Angeles and vicinity amounts to about 18,000 cars. Of this number some 7,000 cars are shipped without refrigeration at "owners' risk." The remaining 11,000 cars are iced refrigerator cars. Each of these cars carries about 10,000 pounds of ice, which occupies about one-sixth of the carrying capacity of the car. The cost for ice per car on the trip to the eastern markets is said to average about $92. The cost of refrigerating the car with liquid air, it is thought, will be about $40 per car, a saving of $52 per car. But that is not all the saving, for, as the liquid air is to be placed beneath the car between the wheels, an entire car load of fruit can be hauled instead of only five-sixths of a car load, as at present, which would still further reduce the proportionate charges for freight on the fruit. If the experiments now about to be tried with this new refrigerant prove one-half as successful as the promoters claim it will, the fruit shipping industry of the Pacific coast will be revolutionized.

A HIGH PRESSURE GAUGE.

THE West Virginia agricultural experiment station has been engaged upon the effect of high pressures upon the bacteria which appear in milk, and for this purpose has employed a hydraulic press and some special apparatus by which pressures as high as 450,000 pounds per square inch have been obtained. This apparatus, by a slight modification, has been adapted to the measuring of the compressibility of liquids, and the results are very surprising. Thus, under a pressure of 65,000 pounds to the square inch, water is compressed over 10 per cent, and alcohol over 15 per cent. These results and the apparatus used are suggested as the basis of a new pressure gauge for high pressures and of great accuracy. It is stated that by such a gauge differences of a pound throughout the range of several hundred thousand pounds can be detected.

SCHENLEY PARK AMUSEMENT CO.'S CASE.

SUES THE YORK MANUFACTURING CO.—FACTS IN THE CASE AS THEY OCCURRED—CONDITIONS OF CONTRACT—CLAIMS OF PLAINTIFF AND DEFENDANT—DECISION.

A CONTRACT was signed September 26, 1894, between the York Manufacturing Co. of York, Pa., and the Schenley Park Amusement Co., of Pittsburg, Pa., for a skating rink plant. The ice making and refrigerating machinery furnished under this contract was to be of the York compound type, with two low-pressure compressors, nineteen inches in diameter by 30-inch stroke, and one high-pressure compressor, sixteen inches in diameter by 30-inch stroke. The engine was to be of the tandem compound condensing type, having high-pressure steam cylinder seventeen inches in diameter, and low-pressure steam cylinder thirty-three inches in diameter. The steam condenser was to be of the jet condensing type. The rink surface was to be kept frozen by the direct expansion process, the balance of the apparatus used to conform with the necessities of the duty to be performed. This contract provided that the plant should be in operation on or before January 8, 1895, providing the buildings were ready to receive the machinery on November 19, 1894. The buildings were not ready to receive the machinery on time. The machinery was finally completed and ready to start on April 20, 1895. It was impossible, however, to start until May 8, on account of the steam plant, which was to be furnished by the Amusement Co., not being ready until that date, nor was the rink completed, ready to to be opened to the public, until May 9, 1895, at which time the machinery was in operation, and the rink remained open to the public for ten days, when it was closed down for the season. During the operation of the plant it was found that the coils in the rink floor were somewhat choked up; hence, after it was shut down, the coils were blown out and additional expansion valves were put in so as to better regulate the ammonia.

On June 21, 1895, the Schenley Park Amusement Co. paid the York Manufacturing Co. $17,500 on account. On June 27 of the same year the York Manufacturing Co. demanded further payment, which they claimed was due them, because the plant was delayed on account of the Amusement Co. not having their buildings ready. On July 3 the Schenley Park Amusement Co. offered to pay $5,000 more, providing the York Manufacturing Co. would sign a supplementary agreement. This the York Manufacturing Co. agreed to do, the agreement being dated August 13, 1895. This agreement provided for a test of the plant in the following fall, and the York Manufacturing Co. was to get a certificate of satisfaction from William Flinn. In case the plant did not perform as guaranteed, then the York Manufacturing Co. was to return all moneys paid to them up to the time of the signing of the supplementary agreement and afterward, and remove their machinery from the premises. On August 15, 1895, the Schenley Park Amusement Co. paid to the York Manufacturing Co. $5,000, making a total of $22,500. In October the Schenley Park Amusement Co. requested that a man be sent by the York Manufacturing Co. to run the test agreed upon, which request was complied with and the man sent October 16, 1895. The plant was then started up and got in order for the test. On November 4 of the same year the rink was opened to the public, and the test began. On November 21 the manager of the Amusement Co. notified the York Manufacturing Co.'s man, who was running the plant, that the Amusement Co. was ready to settle for the plant, and that he should get somebody there in authority on the 25th of that month. The York Manufacturing Co. was notified, and had their manager there to meet the Amusement Co. at Pittsburg at the appointed time, who made a settlement for the plant, at which time $5,000 in cash was paid. This representative then ordered the York men to pack their tools and go back to the shops, which they did; the Schenley Park people agreeing to forward to the York Manufacturing Co. the balance of the money in a day or two. On December 7 of the same year the Schenley Park people sent $5,000 in cash, promising to send the balance in a few days. On December 27 the York Manufacturing Co. agreed to take a personal ninety-day note of William Flinn for the balance due on the plant. This was sent them, and on December 31 of the same year the York Manufacturing Co. acknowledged receipt of the note for the balance due on the plant. The amount of this note was $2,792.74, which was paid when it became due. Up to the time of the settlement for the plant the York Manufacturing Co. had the machinery insured for their benefit, and at the time of the settlement the question of transferring these policies was taken up, the insurance being taken out by one of the interested parties in the Schenley Park Amusement Co. That company had an assignment prepared, and sent the same to the York Manufacturing Co. for their signature on January 27, 1896, the statement showing the amount that was due the York Manufacturing Co. for unexpired premiums on the insurance policies "up to the time that the plant was accepted by them, December 4, 1895." The adjustment between the two companies was made in accordance with this statement, the Schenley Park Amusement Co. paying the York Manufacturing Co. for the unearned premiums up to the time that the plant was turned over to them.

On February 1, 1896, the Schenley Park Amusement Co. discharged the engineer they had, who was a competent man, and put in his place the assistants who had been working under him. From this time they had considerable trouble with the plant, which made it necessary for them to send to the York Manufacturing Co. at different times for a man to go over the plant, regulate it and get it in condition. On February 10 the York Manufacturing Co. wrote to the Schenley Park Amusement Co., warning them against having incompetent men in charge of the plant. The following fall when the machinery was started up, there was some trouble with the operation of the plant, and the Amusement Co., sent to the York Manufacturing Co. for a man, agreeing to pay for his time and expenses, provided it was shown to them that the trouble was not the fault of the York Manufacturing

Co. The York Manufacturing Co.'s man remained at the plant but four or five days, at the end of which time everything was all right, and he returned back to York, upon which a bill was sent for his time and expenses. From this time until the time of the destruction of the plant the Schenley Park Amusement Co. ordered several repairs for the plant, and three days before the fire they ordered a new piston and rod for one of the compressors. All these orders read to the effect that such repairs were to be charged to the Schenley Park Amusement Co. and the bill sent to their office. On December 17, 1896, the plant was totally destroyed by fire. After the fire the York Manufacturing Co. asked to be paid for the several items of expenses and repairs that were then due them, and finally threatened to sue if the amount was not paid, upon which they received a letter from the Schenley Park Amusement Co., dated May 7, 1897, demanding the return of the $35,000 which was paid for the plant, claiming that the plant had never been satisfactory to William Flinn, and that he had never given any certificate of satisfaction. This resulted in a suit being brought by the Schenley Park Amusement Co. against the York Manufacturing Co., on June 11, 1897, for $285,294.31, with interest. The trial of this case took place at York, beginning November 14, 1899, and ending December 4. The demands of the plaintiff were based on the fact that the York Manufacturing Co. had never received from William Flinn a certificate of satisfaction, in accordance with the supplementary contract of August 13, 1895, and they were therefore entitled to a return of the money paid for the plant, and also for damages which they claimed to have suffered in consequence of the burning of the building, which they claim was caused by the bursting of a compressor head on the machine furnished by the York Manufacturing Co.; and they attempted to show that the plant was not satisfactory to William Flinn, and that the destruction of their property was occasioned by inherent defects in the machinery furnished by the defendant, against which they had a warranty in the original contract. They called William Flinn as a witness, who testified that the plant was never satisfactory to him, giving a number of reasons why it was not. He also claimed that he never gave the York Manufacturing Co. a certificate of satisfaction. To prove that their property was destroyed by the machinery furnished by the defendant, they brought, among others, the engineer, Jos. P. Dempsey, who was in charge of the plant at the time it was destroyed.

This witness testified that the time when the accident occurred was 2:15 A. M., on the morning of the December 17, 1896. He claimed that he was sitting along side of the steam cylinder, and everything running as usual, the machine turning over twenty-five revolutions per minute, and being regulated by the throttle valve; that the back pressure was twenty-six pounds to the square inch, and that the high pressure was 140 pounds to the square inch; that without warning the head of the high pressure compressor blew out, and on looking up, he saw "a column of flame shooting up from the compressor head to the ceiling." He stated that this column of flame looked to him like a "blast furnace" or "cupola," and that "it shot up in a continuous stream of fire," setting fire to the ceiling of the engine room. He, being the only man in the engine room, was the only witness that could testify as to what occurred at the time of the accident. On cross-examination, he still insisted upon the "blast furnace" or "cupola" appearance of the fire shooting up from the broken compressor. When being asked as to his experience with ice making and refrigerating machinery, he said that he went to work for the Schenley Park Amusement Co. in the beginning of January, 1896, being hired as an assistant engineer, and that he had never had any previous experience to this, with ice making and refrigerating machinery; that his principal experience had been in operating laundry and elevator machinery. Upon being questioned as to what he knew of the Schenley Park plant, it was found that he did not know that the engines were connected with the jet condenser, nor did he know what a jet condenser was, nor what was meant by a jet condenser. He did not know how many gauges were on the gauge board, nor what gauges were ordinarily used on such a plant. He claimed that at the time the accident occurred, the first thing he did was to shut down the machine, then he went to the front end of the building, 300 or 400 feet away, and gave the watchman notice of the fire. He then returned to the condensers and shut a valve leading to the machine, and from there he returned to the engine room and shut down the dynamo engines, claiming that the inside of the engine room was on fire all this time.

Among the witnesses for the plaintiff were J. E. Denton, J. E. Starr, W. F. Flinn, M. I. Baird, president of the company and J. D. Allen, its architect and contractor. The plaintiffs proceeded to show that about two weeks before the accident they had had one of their machinists take the compressor, which blew up, apart, and had it thoroughly examined and put back in the same shape in which it was found. The machinist who did the work, on cross-examination, stated that he had taken the compressor head off, and had taken the piston out, had examined the rings, and put the piston back in its place. That the top of the piston was smooth, and had no marks on it, and that the bottom of the compressor head was also smooth, and had no marks on it. He said that he did not examine either the suction or discharge valve, except to push the discharge valve up with his hammer handle.

The plaintiff produced in court the compressor cylinder, the broken compressor head, the piston and piston rod. They attempted to prove by experts that "it was possible for a volume of flame to shoot up from the broken compressor" claiming that the head was forced off by liquid ammonia being in the compressor; "that the ammonia was saturated with oil"; "that ammonia was explosive and inflammable, especially when saturated with oil."

They also tried to prove "that the machine did not have a maximum capacity equal to the melting of 150 tons of ice or the making of eighty tons of ice, as specified in contract."

The plaintiff called Prof. James E. Denton, and attempted to prove by him that the machine did not have 150 tons ice melting capacity at forty revolutions per minute, which they claimed the contract required.

Professor Denton stated that the machine would give a duty equal to the melting of 127 tons of ice in twenty-four hours, at a back pressure of twenty-six pounds, or 133 tons at twenty-eight pounds back pressure. On cross-examination Professor Denton agreed that the machine would give a duty equal to the melting of 159 tons of ice at thirty-five pounds back pressure, and that it would give a duty equal to the melting of 190 tons of ice at forty-seven pounds back pressure, the question being: "At what back pressure should the capacity of the machine be figured for ice melting capacity?"

Professor Denton claimed that the back pressure adopted by the trade was twenty-six pounds per square inch above the atmosphere. He then swore that "80 per cent of all the oil that could be applied to a piston rod with a brush outside of the stuffing box, would find its way up into the ammonia compressor." It, however, not being proven that there was any oil at all in the system, the question of oil being mixed with the ammonia was not allowed by the court.

Professor Denton, upon being asked, said: "That it was possible for pure anhydrous ammonia to burst into a powerful flame if it came in contact with an incandescent body, at the point where it changes from a liquid into a gaseous state," claiming "that it was possible for a burst of flame to have come out of the compressor as described by Engineer Dempsey." He claimed that he had experimented with ammonia, and found that the above were facts in the case. He also claimed that anhydrous ammonia would not put out a fire.

John E. Starr was called by the plaintiff as an expert.

As to the capacity of the machine, he gave the same capacities as given by Professor Denton. In answer to a question as to whether ammonia would burn, Mr. Starr stated that it would, and that he had made tests with all kinds of ammonia on the market, such as National, Clapp, Herf & Frerichs', and that they would burn. Citing one experience in particular, in which direct expansion was used in cooling a room ten feet wide, fifteen feet long and six feet high, in which there was a gas jet burning, an ammonia pipe burst, and the effect was a great rush of flame through the door, igniting the woodwork and the whole interior of the room. He claimed that wherever there were leaks in ammonia pipes, a flame or torch applied to the leak would ignite the ammonia.

Upon cross-examination Mr. Starr admitted that the case referred to in particular was where an absorption machine was used. When asked as to the exact point or condition in which ammonia would ignite, Mr. Starr would not agree with Professor Denton, he (Starr) claiming that the ammonia was only inflammable after it became a vapor, and that it must be mixed with a certain amount of air.

The plaintiff then produced and read before the jury some sixty depositions upon the condition of the ice.

The defendant produced seventy or eighty depositions on the same question.

When the plaintiffs had rested their case, the defendants proceeded to prove that the plant was the property of the plaintiff; that it had been accepted and paid for by them more than a year prior to its destruction; that the supplementary agreement contemplated only the return of the money that was paid in accordance with that agreement, which was $17,500. up to the date of the agreement, and $5,000 shortly afterward, making a total of $22,500, and did not mean the money that was paid after the plant was tested and accepted; that at the time the plaintiff company had accepted the plant they had paid the balance due, and that they had not required a certificate of satisfaction from William Flinn, and, as a matter of fact, it was through William Flinn that the plant had been paid for; that this action had waived the necessity of any certificate of satisfaction being issued; that the warranty against inherent defects was inoperative, the time of the warranty having expired; that the plant was being operated by incompetent men, and that it had not been proven that the destruction of the property was caused by any negligence or fault of the defendant company.

The defendant had the broken parts of the compressor head, which was brought into court by the plaintiff, cleaned up and bound together with a band, so that its condition could be easily seen. The piston head and rod were also cleaned up and put in shape for examination.

The plaintiff then called fourteen or fifteen witnesses to testify as to what, in their opinion, caused the break. All of these witnesses testified that the cause of the break was some metallic substance getting between the top of the piston and the bottom of the compressor head, there being a great number of deep dents and abrasions in both the bottom of the compressor head and the top of the piston, and the hole in which the discharge valve had worked was so large that it could come through.

A number of witnesses were called as to the inflammability of ammonia. All of these witnesses testified that they had never seen ammonia burn.

It was also proven by witnesses that it was impossible to get any perceptible amount of oil into the ammonia compressor with the stuffing box used on the machine in question.

A number of letters were introduced to show the transaction between the plaintiff company and the defendant. These letters tended to show that the plant had been accepted unconditionally by the plaintiff company more than a year prior to the destruction of the property. They also proved that the plaintiff company had collected the insurance on the machinery after the fire, and that they had also sold and disposed of all the machinery that was salable since then, and in every way acted as the absolute owners of the plant.

The plaintiffs then agreed that they had accepted the plant, and that the plant was their property, and that they operated the plant, but claimed that, owing to the fact that the plant was not satisfactory to William Flinn, they had the right to recover the amount paid for the plant, as well as an amount to reimburse them for the losses occasioned by the destruction of their property, and that they had a perfect right to dispose of the machinery and collect the insurance without giving the defendant company any credit for that amount.

[*Translated from* Eis und Kaelte-Industrie.]

A NORTH-GERMAN ICE FACTORY.

BERLIN SYNDICATE ENLARGES ITS PLANT—RAPID CONSTRUCTION—DISPOSITION OF MACHINERY—OPERATION OF PLANT—TEST AND RESULTS—OUTLINE VIEW.

THE winter of 1898–99 brought but an insufficient ice harvest, in consequence of which the North German Ice Works at Berlin, Germany, decided to build an additional plant for the manufacture of ice. The new plant was to be used exclusively for ice making during the first year, but thereafter the machines were to be utilized in supplying refrigeration for a large cold storage and freezing plant.

In the early part of the month of March two ammonia absorption machines, each of twenty-six tons daily capacity, were contracted for. The company also owned an old 16-ton absorption machine, which was thoroughly overhauled.

Absorption machines were selected because these were thought to be of the highest efficiency under the very low temperatures that would be required in the contemplated freezing works, and because the newer types of these machines required less fuel in producing low temperatures. This syndicate had previously put in three absorption machines, and the year before one compression machine.

April 1, 1899, a site was secured for the new plant. On May 8 construction of the buildings began, and so rapidly was the work pushed and so promptly was the machinery delivered that on July 17 the first machine, on July 23 the second machine, and on August 5 the smaller renovated machine was producing ice. By August 5 the entire plant was in operation.

The disposition of the machinery is shown in the accompanying illustration. As may be seen, space is provided for a fourth machine, as also for an additional engine, which, it was thought, might be necessary to insure sufficient power when the cold storage and freezing rooms were started. Additional boiler room was also left for the same reason. The two new ice plants are so arranged that the expansion coils, instead of being placed in the freezing tanks, are placed in a special brine cooler reservoir, *V*, so that the cold brine may be conveyed either to the ice tanks or to the proposed freezing chambers, as may be desired. This arrangement was provided in order to avoid the necessity of cooling both ice tank and freezing chamber when only the latter was to be used.

In the freezing tank there are 800 cans placed in fifty sections, each section holding sixteen cans. The weight of the ice blocks formed in each of the cans is about sixty pounds. The small ice machine serves 392 cans, arranged in twenty-eight sections of fourteen cans each, the ice cakes produced weighing twenty-five pounds each.

The water in the cans frozen by the two large machines, is agitated by a dipping blade so that the ice, except for a tolerably large white core, forms a clear, transparent block. For the small machine the condensed steam is used, being first passed through the distilling apparatus *L*, and, when frozen, forms clear, transparent blocks without core.

The agitation of the brine cooled by the small machine is accomplished by means of agitators, but for the two large machines the brine is drawn from the tanks by a powerful centrifugal pump, *w*, to the brine cooler, from whence it flows back to the tanks. The cans filled with ice are taken out of the tanks by means of a traveling crane and hoist.

The cooling water is drawn from an artesian well by two rotary pumps, *o*, and pumped into a reservoir *i*, situated above the machine room. The temperature of the water is about 50° F. The water used to fill the cans of the large machines is cooled to about 41° F. by the returning cold gas from the coils.

The condensed steam from the ice machines is used to feed the boilers, being first passed through a feed water heater, *n*, where it is brought to a temperature of 206° F. by the exhaust from the small high pressure engine, and then through the purifier *m*, to the feed water tank *k*. The water flowing to the very slow acting feed water pump *l*, has still a temperature of 197° F.

The fuel used under the boilers is high grade bituminous coal, costing M.16 ($3.84) per long ton. The fuel gases arising are measured by a self-registering mercury pyrometer, which shows that their temperature seldom rises above 392° F.

In regard to results, careful minute examinations had not yet been made, for during the test period no account was taken of the relative amount of power used to operate the pumps or the crane in the tank room, etc. The tests, further, were not taken on the results per hour of continuous service, but by days, and included unavoidable interruptions. It was found that one boiler of about ninety *qm.* (about 950 square feet) heating surface was sufficient to operate the two new machines. Both boilers were used when the three machines were in operation, but in this case they were not used to their full capacity, and quite evidently were capable of doing more work.

Tests made for the week beginning August 26 and ending September 2, during which period four hours were lost, August 31, through failure of the main belt, while on another day two of the machines were obliged to stop for one hour because of the bursting of a suction pipe, resulted as follows:

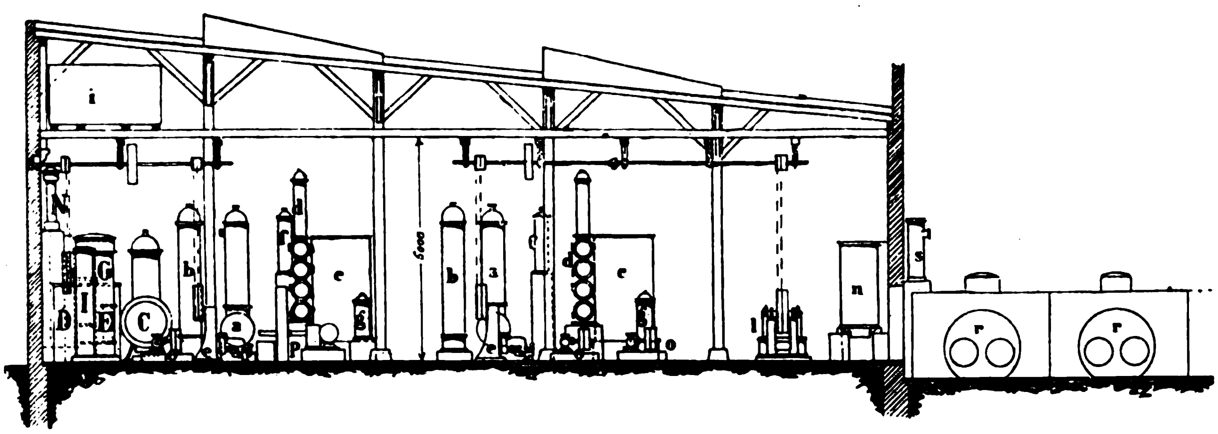
Machine No. 1 produced in the seven days a total of 179,220 kilograms (197.14 tons) of ice, or an average of 25,600 kilograms (28.17 tons) every twenty-four hours.

Machine No. 2 produced 193,640 kilograms (213 tons), or an average of 27,662 kilograms (30+tons) every twenty-four hours.

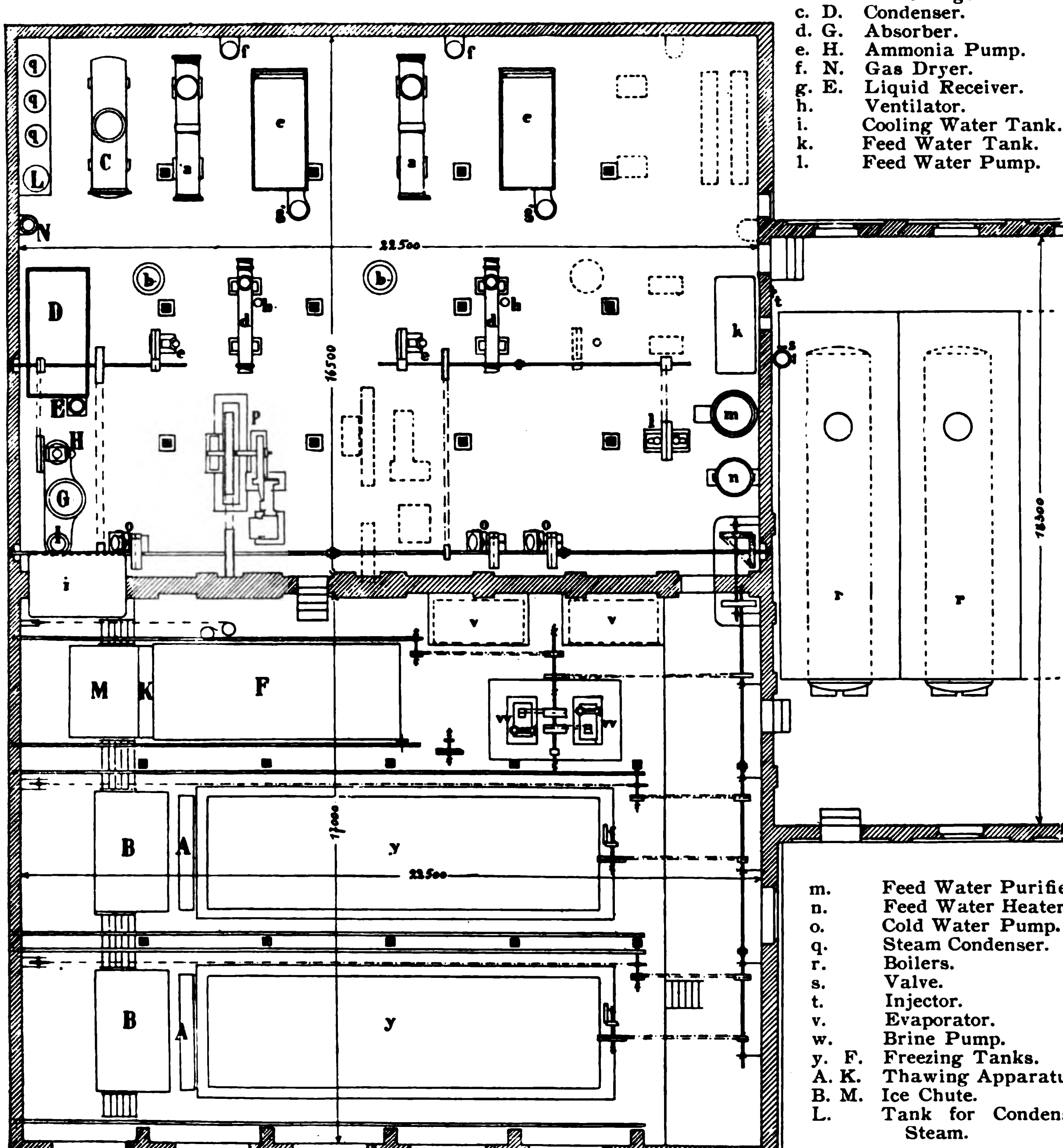
The small machine produced a total of 115,500 kilograms (127.06 tons) in the seven days, or an average of 16,500 kilograms (18.1 tons) of ice every twenty-four hours.

The total output of the three machines was 179,220+193,640+115,500=488,360 kilograms (537.20 tons) for the seven days, an average of 69,762 kilograms (76.74 tons) per twenty-four hours.

The total amount of coal consumed during the seven days was 39,675 kilograms (43.64 tons), or an average of 5,668 kilograms (6.23 tons) per twenty-four hours. In other words, for each ton of coal consumed 12.32 tons of ice were made.



a. C. Ammonia Tank.
b. J. Interchanger.
c. D. Condenser.
d. G. Absorber.
e. H. Ammonia Pump.
f. N. Gas Dryer.
g. E. Liquid Receiver.
h. Ventilator.
i. Cooling Water Tank.
k. Feed Water Tank.
l. Feed Water Pump.



m. Feed Water Purifier.
n. Feed Water Heater.
o. Cold Water Pump.
q. Steam Condenser.
r. Boilers.
s. Valve.
t. Injector.
v. Evaporator.
w. Brine Pump.
y. F. Freezing Tanks.
A. K. Thawing Apparatus.
B. M. Ice Chute.
L. Tank for Condensed Steam.

SECTIONAL VIEW—NORTH GERMAN ICE WORKS, BERLIN, GERMANY.

ANSWERS TO CORRESPONDENTS.

FROSTING OVER TO COMPRESSOR—QUANTITY OF AMMONIA FOR A CHARGE—TO CLEAN OUT AMMONIA COILS—RED CORE IN ICE, ETC.

[This department of ICE AND REFRIGERATION is conducted for the benefit of the trade generally, as well as individuals; and all competent inquiries will be given timely and proper attention, precedence in all cases being given to such questions as are of general rather than of individual interest. Correspondents will please write only on *one* side of the sheet. Persons desiring to communicate with correspondents using this column will do so by addressing them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago. All communications to this column are treated as confidential, and the names of the writers will not be disclosed without their permission. Anonymous communications will not be answered in this column.—ED.]

TO PREVENT FROSTING OVER TO COMPRESSOR.

To the Editor: Will you kindly advise fully through the columns of ICE AND REFRIGERATION on the following subject: We have an ammonia brine system used for cooling eggs, also one room (direct expansion) for storing butter. By cooling the brine to about 19°, then stopping the refrigerating machine until the brine gets to about 25°, we only have to run the machine about ten hours out of twenty-four. Using the machine such a short time compels us to freeze rather heavy on the direct expansion room, which causes freezing back to the compressors (dry gas compressors) that we would like to avoid. This room and the machinery are in the basement. It is our intention to run the return from this room up to the third floor through a few coils and back down, connecting with the return from the brine tank. This I think would prevent freezing back to the machine, and also cool the room on the third floor which is used for candling eggs. Do you think this plan would work? R. F.

ANSWER.—The system you have adopted in the refrigeration of your rooms, viz., part brine circulation and part direct ammonia expansion, covers a complication of conditions that we have noted as almost universally unsatisfactory, for the reason, in our opinion, that the wide variation in temperature as between the temperature of the brine in the brine tank and the temperature of the atmosphere in the room or rooms operated by direct ammonia expansion, necessarily results in a variation of back pressure as between the two sets or systems of expansion surfaces, and the result is that there must be a most delicate adjustment of the expansion valves to secure an equalization of the terminal pressures from the two expansion surfaces, as otherwise there must be a backing up of pressure from the surfaces in which the back pressure is the highest to the surfaces in which the back pressure is the lowest, and as these conditions will vary with the variations of the regulation of the expansion valves, there can be no uniform and regular circulation of gas throughout the entire system, without the most careful and delicate adjustment of the expansions; and as the requirements of more or less liquid feed change with the changes of temperature of the matter surrounding the expansion surfaces, the adjustment of the expansion valves becomes a matter of almost constant attention. Our recommendation would be to change your plant so as to operate the entire refrigeration by either brine circulation or by direct ammonia expansion, preferably by brine circulation, and not to waste your time and your energy in the attempt to produce uniform and satisfactory results in a combination of the two systems. In a brine system, provided with sufficient piping in the rooms to furnish the requisite cooling surfaces, properly connected up, and the rooms adequately insulated, any desired temperature necessary for the practical preservation of cold storage commodities can be produced and maintained without any delicate adjustment of the expansion valves, and without the constant attention required to direct ammonia expansion. We do not favor direct ammonia expansion systems at all where the machine is to be shut down part of the time, as seems to be the case with your plant. A large brine tank, sufficient to hold enough brine to circulate during the period of your shut down, would seem to be the most practical solution of your difficulty, and then change the direct expansion part of your plant to brine circulation.

The change you propose would have a tendency to prevent the frosting over to your compressors to a certain extent, depending entirely upon the care you exercise in the regulation of the expansion valves. You could, even with the increased expansion surfaces, carry the frost over to the compressors by merely giving a very little too much liquid feed, consequently the increase of expansion surfaces by the addition of the room above would not, necessarily, obviate your trouble, although it might make it a little easier to keep the frost back, provided you do not object to more or less dripping of the pipes as the frost runs back and forth in the egg candling room. If you attempt to frost the coils in the egg candling room to their terminals you will experience just as much difficulty in keeping the frost off the compressors as you have experienced without the candling room on, because as the temperature of the two rooms runs down the feed must be checked or the frost will run over to the compressors.

There is but one way that we know of to positively prevent the frost running over to the compressors on a direct expansion plant, under all conditions of operation, and that is to place a tight tank, with a spiral coil the size of the suction pipe to the compressors, on the suction line between the rooms and the compressors, and carry all of the gas from the rooms through the spiral coil in the tank, while the water used for cooling purposes on the condenser is pumped through the tank and surrounding the spiral coil. The water is pumped into the bottom of the tank and taken out at the top, and from there up to the condenser. This system will warm up the return gas sufficiently to prevent frosting over to the compressors, at the same time it will cool the condensing water appreciably, yet there is absolutely no gain to be secured from the apparatus, other than the bare gain of keeping the frost off the compressors, as every unit of heat taken out of the water by the gas passing through the spiral coil must again be given to the water at the condenser. It only checks the frost line at the tank.

QUANTITY OF AMMONIA FOR A CHARGE.

To the Editor: Will you please give us a little information? We have two 75-ton consolidated single-acting refrigerating machines. One has a freezing tank containing 10,740 feet of 1¼-inch pipe, and about 11,000 feet of 2-inch expansion pipe in ice storage rooms; the condenser is seven stands of 2-inch pipe, twenty feet long by twenty-four pipes high, equal to 3,500 feet. The other machine has one freezing tank with 14,500 feet of 1¼-inch pipe. Condenser is four double coils of 2-inch pipe, equal to about 3,600 feet. What we want to know is, How much ammonia will be required for a charge in the beginning for each machine, and about how much will be required for the season of about eight months' continuous running, everything supposed to be tight and in good shape? C. C.

ANSWER.—There is a wide divergence of opinion among experts relative to the proper amount of

ammonia to make a sufficient charge for a given capacity of plant, and this difference, in our opinion, is largely due to the fact that some engineers consider it essential to the successful operation of their plants to have the evaporating coils contain a considerable quantity of liquid at all times, while others endeavor to prevent an accumulation of liquid in the evaporating coils, and depend upon the expansion of humid gas in the evaporating coils to absorb the heat from the surrounding matter.

The builders of the machines you have in operation have always recommended as light a charge of ammonia as possible, claiming that an overcharge of ammonia is not only detrimental to the regular and practical operation of the plant, owing to the fact that with an overcharge the evaporating and expansion surfaces are liable to become flooded with liquid, curtailing the active surfaces, but also that an overcharge is an element of constant danger, in that the combined capacity of the condenser and liquid receiver would not be sufficient to enable pumping out the evaporating coils and completely evacuating the same, in the emergency of necessity for repairs on the coils. If the condenser and liquid receiver should be completely filled with liquid, and the valves closed to lock the liquid in the high pressure side of the apparatus, it would only require a comparatively slight rise in temperature of the surrounding atmosphere to cause an expansion of the confined liquid, and the result would undoubtedly be a rupture of some part of the apparatus, if not a dangerous explosion.

We would not recommend a heavy charge of ammonia in any ice making and refrigerating plant, for the reasons above given, and we would never charge a plant with more ammonia than could be held in the high pressure side of the apparatus, with sufficient allowance for expansion to positively preclude the possibility of an explosion. It sometimes becomes necessary to pump out the evaporating and expansion side of the plant, consequently there should not be more liquid in the entire plant than can safely be stored in the high pressure side.

The ordinary practice of the Consolidated Ice Machine Co. was to charge their 75-ton plants with from 600 to 800 pounds of liquid ammonia, and this amount was found to be ample for the practical operation of the plants; and their condensers and liquid receivers were constructed sufficiently large to safely hold the entire charge even when the entire charge was pumped over to the high pressure side of the apparatus. When a liquid receiver will show even a few inches above the outlet pipe of liquid in the glass gauge, when the machine is in constant operation there can be no question that there is sufficient liquid in the apparatus to operate the same practically and satisfactorily, as it is then a sure thing that the pipe leading from the liquid receiver to the exansion valve is completely full of liquid and is supplying a constant stream of liquid to the valve. Under such circumstances if the back pressure can be held up to the required limit, or until the frost line shows on the suction pipe beyond the end of the expansion surfaces, without blowing hot gas from the condenser to the expansion valve, or, in other words, without lowering the level of the liquid in the receiver below the level of the outlet pipe from the receiver to the expansion valve it is a positive certainty that there is an ample charge of ammonia in the plant to operate the same to its maximum capacity, and any additional ammonia above this amount would be not only useless but also absolutely detrimental, as excess ammonia in a plant increases the liability of flooding the surfaces and certainly enhances the chances of danger.

As to the amount of wastage of ammonia on any plant on a season's run, would say this depends entirely upon the tightness of the joints and the care the engineer in charge exercises to detect and stop leaks of all kinds. We have known of plants being operated two and three seasons without any ammonia whatever being added to the original charge; and on the other hand, we also have known of numerous instances in which plants have been recharged completely several times in one season. There is no rule that will hold good in all cases in this regard, but it is fair to assume that the average plant is recharged at least once a year, generally at the beginning of every season.

TO CLEAN OUT AMMONIA COILS.

To the Editor: Will you please advise in your January number the best and safest way to clean out ammonia coils in tank? We disconnected each coil from the header and blew live steam through them until they were so hot that you could not hold your hand on them. We then used an air pump to get all the condensed steam out of the coils. After connecting back to the header we put a pressure on the coils of seventy-two pounds, and let stand twenty-four hours. We then opened the by-passes on our suction and ran the machine very slow until we could smell ammonia very distinctly. Was this the best way? We have a Hercules machine. J. C. M.

ANSWER.—The ordinary method of cleaning out the coils in freezing and condensing tanks is to disconnect the coils from the manifolds and blow out the coils with live steam from the boilers, at full boiler pressure, so as to remove all oil, weak liquor or other foreign substances, and, while the coils are good and hot, it is the usual practice to carefully clean the outsides and paint with first-class waterproof paint, as the paint will enter the pores of the pipe much better when the pipe is hot; and the paint will also dry quicker on the hot coils than it will when the coils are cold. After shutting off the steam it is best to blow out the coils at once, while the metal is hot, with heavy air pressure, which will remove any condensation which may have formed in the coils from the steam. In some cases, where coils have been in use for a considerable period without cleaning, it is found that the interiors become coated to a greater or less extent with a material that will bake hard when steam is applied, and will not blow out clean by steam pressure alone. In such cases it is often found necessary to pickle out the cleating with a strong solution of soda ash by filling the coils completely with the soda ash solution and allowing it to stand in the coils for a day or two, and then blowing out the coils clean with steam and air pressure, as above described. The method you have described is, in our opinion, all right, excepting that we would not recommend the idea of pumping up the seventy-two pounds air pressure on the coils and allowing it to stand twenty-four hours under that pressure, and then blowing out the air by admitting ammonia gas to drive the air out. We are aware

that is common practice among engineers, but it is bad practice for two reasons—first, all air contains more or less moisture, and there could be no better means devised for condensing the moisture out of the air into the coils than to pump the air in comparatively hot and then allow it to stand under pressure until it cools down. When testing with air pressure and allowing the pressure to stand on the system all night, as is often done, the system should be carefully blown out with high pressure, and consequently hot air after the pressure is let off; then, rather than to attempt to force remaining air out of the system by the admission of ammonia gas under pressure, we would always recommend pumping a vacuum on the system to remove all the air before allowing any ammonia gas to enter.

IN RE RED CORE IN ICE.

[An additional reply to "M. C.'s" question in the December issue of ICE AND REFRIGERATION, page 405, is sent by Mr. Fred Kaiser, of Savannah, Ga., who says he writes from "practical experience had with such water years ago before ICE AND REFRIGERATION was published and before the ice maker had the opportunity to write and have the nut cracked for him." We append the reply.—ED.]

REPLY.—Reading in ICE AND REFRIGERATION of December under "Answers to Correspondents" the troubles of "M. C.," I wish to mention one more possible source for the red core in his ice—that is, the boiler feed water. Surface water in swampy localities, water from coal, copper and iron regions, will leave, very often, a reddish deposit in the form of a fine dust or powder in the steam space of a boiler as well as on the inside walls of steam pipes. In an ice plant this stuff works its way through the whole distilling apparatus and filters, and shows up in the ice as a more or less reddish core. Sometimes a good surface blow-off on the steam boiler will remove most of the impurities, but far better results can be gotten in boiling the feed water before it enters the boiler, in an open tank of about 200 to 300 gallons capacity. The supply pipe for this tank should have a float regulating valve so as to keep the tank at all times overflowing enough to carry off the scum which will accumulate on the surface of the water.

If brother M. C. will inspect the inside of his steam pipes and distilling apparatus, he will soon find where the "red powder" starts from. If he has a reddish coating inside his steam boiler and pipes, then his feed water or some poor boiler compound is the cause of it. If this part should be clean, and the stuff shows up beyond the engine in the exhaust pipes and steam condenser, then the cylinder oil has something to do with it; should, however, the pipes be also free from red, then the distilled water cooling coils inside are not galvanized and are alternately exposed to water and air, which will make them rusty. The way of many an ice man would be less hard if he were more particular to get the impurities out of the boiler feed water before it enters the boilers. There are live steam feed water heaters and purifiers made; properly handled, these will keep a boiler free from scale, and the white core out of the ice, if hard water is used. A good water filter used with soft, but muddy, water will prevent a boiler from getting foul, and keeps the yellowish tint and brackish taste out of the ice. Sometimes home made affairs, on the plan of settling tanks with the use of tri-sodium phosphate, give splendid results, all according to the nature of the water on hand. It is no use to try to feed a boiler with dirt, lubricate the steam cylinder with axle grease, and expect to shake crystals out of the ice cans at the other end.

NATURAL VS. MANUFACTURED ICE.

To the Editor: I am undetermined, and I want to get some practical information about the differences between natural and artificial ice, and as parties here are having some fake tests made and are making claims that their own tests do not prove, I would like some reliable information. Will you please send me some book which will explain the difference in lasting qualities of ice exposed to the air and the difference in refrigerating qualities of snow ice, hard northern ice, porous ice, etc., and you will greatly oblige P. R. W.

ANSWER.—We would say that there is no essential difference between natural and manufactured ice if equally well made, except that the latter, if made from distilled water, is purer, chemically and bacteriologically speaking, than the natural ice. Some natural ice will last longer than some manufactured ice, and *vice versa.* This depends altogether on the surface. Ice with cracks, or with core holes, will for this reason melt sooner than solid ice without pores, cores and cracks. And the nearer the block approaches a perfect cube in form the longer will it last, other circumstances being equal. Porous ice of any kind, and therefore doubtless also snow ice will not last as long as clear solid ice, no matter whether the latter is manufactured or not. A little also depends in this direction on the temperature of the ice itself, for if the latter is much below the freezing point it will add so much to the refrigerating capacity.

REFRIGERATION WITH COLD WATER.

To the Editor: I wish to ask you if there is a process of refrigeration anywhere in use, in which a circulation of very cold water, say 36° to 38° F., could be used. If there are any such, you are in a position to know of them, and we would like to have you advise us. H. H. B.

ANSWER.—A circulation of water of 36° to 38° F. could only be used for such refrigerating purposes which permit still higher temperatures as their ultimate object. This is the case, for instance, in the refrigeration of dwellings, hospitals, certain factories, etc., in which a temperature of about 60° F. in summer time is very desirable. For such purposes a circulation of cold water through a series of pipes of sufficient surface would answer quite well, and it has been applied in this manner with good success, if our memory serves us right.

REFRIGERATION REQUIRED.

To the Editor: How many tons of refrigeration would a packing house of the following capacity require?

Fifty hogs killed daily. One chill room, 38×12×10 feet, to be held at 32° F.; one storage room, 38×26×10 feet, to be held at 34° F.; one storage room, 40×12×10 feet, to be held at 45° F.

Would two double-acting ammonia compressors of 4⅛-inch bore and 9-inch stroke, run at a speed of 150 revolutions, do the above work? How many tons of refrigeration would the above mentioned compressor take care of?

ANSWER.—The compressors, if run at the speed mentioned, should be able to take care of at least twelve tons refrigeration. However, we think the speed might be lessened somewhat, which you can do very well, as the rooms described by you should not require over six tons of refrigeration with fair insulation.

EXTREME COLD FOR TEMPERING COPPER.

WHAT is thought to be one of the more valuable discoveries in connection with the use of liquid air is credited to a Kentucky scientist, whc claims to have discovered the lost art of tempering copper by means of intense cold. When steel is tempered and hardened it is first heated and softened, and then thrust quickly into cold water. The recent discovery shows that copper is affected in just the opposite way. When placed in the intense cold of liquid air and chilled to a temperature of 312° below zero, the copper is softened, and then, if rapidly thrust into a hot furnace, it is tempered and hardened. The value of this discovery is said to be very great, as copper, if it can be tempered, is the most serviceable metal for machinery bearings and for a host of other uses.

ON another page will be found an interesting and instructive, as well as wholly disinterested, article on the need of suitable apparatus for indicating the refrigerating machine. Economy of operation frequently means the difference between profitable operation and failure, or between satisfactory dividends and meager and unsatisfactory profits. This is well pointed out by Mr. Wakeman in the article cited, and we commend its perusal to the owners of ice and refrigerating machines. The most complete treatise on the construction and operation of this simple but valuable contrivance is to be found in a little volume entitled: "Indicating the Refrigerating Machine," written by Gardner T. Voorhees, S. B., mechanical engineer with the Quincy Market Cold Storage Co., at Boston, Mass., and published by H. S. Rich & Co., of New York and Chicago.

OBITUARY.

——John Treser, owner and manager of the John Treser Ice Factory at Newcastle, Pa., died in that city on Friday, December 1, 1899, as a result of injuries received ten days previous by being struck on the head with a falling brick.

——Henry A. Humphrey, a director and general manager of the Brooklyn Bridge Freezing and Cold Storage Co. and treasurer of the Harrison Street Cold Storage Co., Brooklyn, N. Y., died last month at the age of thirty years.

——The City Brewing Co., Louis F. Knipp, proprietor, Janesville, Wis., is having its plant equipped with direct expansion piping by the Fred W. Wolf Co., of Chicago.

——William Wilson, formerly representing the Vilter Manufacturing Co., of Milwaukee, with headquarters at Louisville, Ky., has now taken charge, as general manager, of the Allen Ice Machine Co. at Brooklyn, N. Y.

——It is reported that the Wharton Electric Light, Ice and Cold Storage Co., of Wharton, Tex., had been refused a charter because of an old Texas law which does not permit an incorporated company to transact more than one kind of business.

——The first government aided cold storage building for bait for deep sea fishermen in Canada was successfully completed last month at Ballentyne's Cove, Cape George, Antigonish county, N. S. The erection of this building marks the beginning of an era of prosperity for the fishing industry of the Maritime Provinces. It is the forerunner of a large number of similar buildings at different fishing centers, insuring a steady and continuous supply of bait at all seasons.—*Cape Ann Breeze.*

——The Piper Ice Co., of Chicago, Ill., has filed notice of the dissolution of the company.

——The ice dealers of Des Moines, Iowa, are preparing to harvest and house about 36,000 tons of ice.

——Wm. Durfee, of Fall river, Mass., has purchased the D. H. Anthony ice plant at Assonet, and will enlarge same.

——C. S. Bates & Co., ice dealers and harvesters, at Portland, Me., were reorganized and the business incorporated as the Bates Ice Co., with C. S. Bates, president; J. Chisholm, treasurer, and W. L. Delano, secretary.

(OFFICIAL.)

SOUTHERN ICE EXCHANGE.

PROGRAMME OF MEETING OF SOUTHERN ICE EXCHANGE AT MOBILE, ALA., FEB. 22-24, 1900.

Thursday, Feb. 22.—Opening at 10 A. M. in German Relief Association hall. Address of welcome by Hon. J. C. Bush, mayor of Mobile, Ala., followed by business session.

2 P. M.—Boat excursion on Mobile river and bay. Lunch aboard steamer.

Friday, Feb. 23.—Session opens at 10 A. M. General discussion.

3 P. M.—Trolley party about Mobile and suburbs.

9 P. M.—Banquet at Battle House.

Saturday, Feb. 24.—Business session at 10 A. M.

1 P. M.—Lunch and reception at the Mobile brewery.

Adjournment.

HOTEL RATES.

Battle house (American)—$2.50 to $4 per day.

Windsor (European)—$1 to $1.50 per day.

New Southern (European)—75 cents to $2 per day.

Klosky's (European)—$1 per day.

Headquarters, Battle House. Bureau of information, Room 16.

RAILROAD RATES.

It is confidently believed that one fare for the round trip will prevail for all members of the Exchange from all points. The positive rate will be announced by letter and also in February issue of ICE AND REFRIGERATION. Any information desired by the members of the Exchange can be obtained by addressing A. S. LYONS,

Chairman Committee of Arrangements, Mobile, Ala.

COMPANY ELECTIONS.

——The officers and directors of the Torrington Ice Co., which was recently organized at Winsted, Conn., with a capital of $17,000 were elected as follows: E. H. Hotchkiss, president; G. H. Braman, secretary; F. A. Pickett, treasurer; O. R. Fyler, W. W. Mertz, M. T. Hayes and W. E. Besse, directors.

——The Consumers Ice Co., Grand Rapids, Mich., elected the following officers for the ensuing year: President, A. B. Knowlson; vice-president, A. S. Ainsworth; treasurer, N. Fred Avery; Secretary, C. C. Folmier; manager, Joseph Horner. It was also decided to increase the ice storage capacity by about one-third.

——At the annual meeting of the Crystal Ice Co., of Ironton, Ohio, the following officers were elected: Directors, James Hudson, J. D. Foster, E. Klein, S. B. Steece and J. A. Turley. The board was organized by electing James Hudson, president; J. D. Foster, vice-president, and J. A. Turley, secretary and treasurer.

——At a special meeting of the Delaware Ice Co., of Easton, Pa., the following were elected to fill vacancies in the board: James R. Zearfoss, Clinton Hilliard, Frank Wilson and James E. Wilson. Subsequently the board reorganized by electing Mr. Zearfoss, president, and Mr. Hilliard, secretary and treasurer.

——The Moline Ice Co., Moline, Ill., elected as officers for the ensuing year: President, George A. Darling, Rock Island; vice-president, Kinsley Mack, Rock Island; secretary, J. W. Atkinson, Moline; general manager, Swan Tropp, Moline. It was stated that the company intended to cut about 15,000 or 16,000 tons of ice this winter.

——The Mound City Ice and Cold Storage Co., of St. Louis, Mo., has elected the following officers to serve during the coming year: D. C. Miller, president; R. N. Miller, vice-president; Louis Hoffman, treasurer; O. S. Miller, secretary; George J. Cobsth, in addition to the above named, constituting the board of directors. The capital stock of the company was increased from $150,000 to $200,000, all paid up.

——At the ninth annual meeting of the Ice Manufacturing Co. of Germantown, Germantown, Pa., M. L. Finckel, H. W. Pletcher, William Sidebottom and Arthur Freeston, the retiring members of the board of directors, were re-elected for a period of two years. Hiram C. Himes and D. S. Krieble were re-elected secretary and treasurer respectively. The company reports that the business of the year past showed an increase in the sales of ice and distilled water over that of any year in the history of the company, and the usual 4 per cent dividend was declared. Improvements aggregating a cost of $29,439.25 had been made during the past year, and it was stated that the improvements could not now be made for less than $50,000.

REFRIGERATION ABROAD.

A REVIEW OF THE CONDITION OF THE REFRIGERATING TRADE IN EUROPE—AN EXPERIMENT IN FRUIT SHIPMENT—NEW BRITISH ICE ASSOCIATION—ITEMS.

A CURSORY view of the general field for refrigeration shows many causes for congratulation, especially in England, and to a lesser degree also on the Continent. At no time in the past have the manufacturers of ice and refrigerating machinery been as busy as they are at the present time. In England this is partly due to the increased demand for steamship refrigeration occasioned by the extraordinary demand for transportation of food supplies to South Africa. Every available transport fitted out with refrigerating machinery was pressed into the service of the government, so that the ordinary refrigerated shipping service was seriously crippled. The immediate effect was increased orders for marine refrigerating machinery, as may be seen by consulting any list of vessels in course of construction or being refitted, or by noting the report of the principal manufacturers of marine refrigerating machinery in England. One new feature in refrigeration on board vessels may here be mentioned, viz.: That low temperatures have been found essential for the storage of certain types of ammunition, and a consequent increase in the demand for cold storage space. This fact may also necessitate the extension of refrigeration to include magazines or ammunition stores on shore.

Another cause for increased activity is to be found in the general demand, both in Great Britain and on the Continent, for cold storage facilities for food products. In England the growth of the frozen meat trade with Australasia and Argentina necessitates huge receiving depots, such as are now about to be erected at the London docks, or have lately been erected at Liverpool, Manchester, and other places. In Germany the municipal market system with cold storage is becoming popular. Even Russia is wide awake to the advantages of cold stores to aid its export trade in poultry, butter, fish, caviar, etc., and a number of new stores are building and projected. Even Italy is beginning to awaken from its lethargy in this matter, and to recognize the economy of cold storage. The Latin countries will doubtless present a fair field for manufacturers of refrigerating plants in the not far distant future.

A NUMBER of British ice manufacturers, representatives of ice machine makers and of the ice trade papers, met at the Chamber of Commerce, London, December 8, 1899, and formed the nucleus of a proposed British Ice Association, Mr. R. M. Leonard, editor of London *Cold Storage*, being elected as honorary secretary and a committee arranged for to draw up a constitution for the Association. The objects of the Association were set forth as follows:

To promote the refrigerating industry, the cold storage business and the ice trade in all branches; to benefit and safeguard the interests of members in all matters affecting their business welfare; to enable members to meet periodically and to correspond, and to facilitate the interchange of ideas respecting improvements in the various means of producing cold, and the applications thereof, and to publish and otherwise communicate information on such subjects. The members, as proposed, would be all British subjects having a real connection with the refrigerating industry, with the keeping of cold stores for the use of the public and with the ice trade; the associate members, all British subjects who are ineligible as members, but use refrigerators, cold stores and ice for domestic or trade purposes, and also shareholders in ice and cold storage companies; and the honorary members, all persons of eminent scientific acquirements, of any nationality, public servants of the crown, and any persons prominently connected with the refrigerating industry, the cold storage business or the ice trade in foreign lands, such as are approved by the council.

Among ordinary members would be reckoned manufacturers of refrigerating and ice making machines, and of ice safes and refrigerators; makers of all accessories—insulating material, ammonia, CO_2, lubricants, valves, etc.; engineers, consulting or otherwise; manufacturing chemists, architects, cold store builders, ship builders, ice importers and merchants, retail as well as wholesale. In the associate members' class would be brewers, frozen meat and colonial produce exporters and importers, butchers, fishmongers, dairymen, shippers, hotel keepers, confectioners and manufacturers in whose business cold storage plays a part—chocolate makers, bacon curers, etc.

AN interesting experiment in the shipping of fruit in cold storage is reported in the case of a shipment of apples and pears from Victoria, Australasia, to England. Ordinarily where the fruits are put in the cold stores they are wrapped in tissue paper, but in this case, over the tissue paper, a quantity of asbestos or a preparation of asbestos had been wrapped around each piece of fruit. Upon unpacking the case it was found that the asbestos had caked about the fruit, but was easily broken off and crumbled. The fruits thus encased were said to be in perfect condition, although five months had elapsed since they were thus packed.

MISCELLANEOUS FOREIGN ITEMS.

——A project is under way to establish public markets, abattoir and cold storage facilities on an extensive scale at the town of Millwall, England.

——The markets committee of the city council at Dublin, Ireland, has recommended the erection of a refrigerating plant at the abattoir connected with the city markets.

——Complaints are made in the British press of the "emaciated" character of much of the frozen mutton that comes from Australia to the London market. Out of one shipment of 2,000 carcasses, 1,491 were condemned for this cause.

——At a meeting, last month, of the Bradford (England) city council it was decided to invite tenders for the supply and fixing of refrigerating machinery in duplicate, and also for the insulation of the entire available space at the cold stores now under construction at St. James' abattoir extension.

——The Australian Chilling and Freezing Co., Aberdeen, N. S. W., have in contemplation, says a Queensland paper, the erection of large works in southern Queensland. A site near Brisbane will probably be chosen, and about £40,000 to £50,000 be expended on the new works. The capacity is to be equal to the freezing of 5,000 bullocks and 6,000 sheep per week, or 12,000 to 15,000 sheep alone.

——The Canadian shippers made loud complaint last month because the British war department had withdrawn so many refrigerated vessels from the Canadian route that insufficient space was available in which to ship Christmas turkeys to their kin in old England. Some 75,000 to 100,000 turkeys in all were shipped in the few boats available, while nearly three times that number were obtainable for shipment.

——According to *Ice and Cold Storage*, of London, some recent shipments of fresh late grapes sent in cold chambers to Manchester from Canada, have proved to be a decided success. These new grapes have already produced a sensation in fruit trade circles, for when arrangements have been completed the English markets will be kept well stocked with regular shipments of fresh grapes put up in dainty little baskets. The quality of the fruit is excellent, and it is highly satisfactory to know that Canada can send to the mother country all the late cheap grapes needed.

——The Hamburg-American Line and the North German Lloyd are each having two new vessels built at Stettin, Germany, both vessels to be fitted with ice making and refrigerating machinery on the Linde system. One of the Lloyd vessels, in addition to the usual cold stores and ice making machinery,

has two of its state rooms refrigerated, adding wonderfully to the comfort of the passengers, especially when passing through the tropical regions. Three other vessels of the North German Lloyd are to be thus fitted out, which will give this company in all twenty vessels fitted with Linde refrigerating machines.

——When fish are preserved in cold storage mold is apt to appear on them, and this is a serious trouble. The cause of it is not very well understood, but the necessity of fighting it is obvious, and the fish commission recommend spraying the fish with a mild dose of formalin to destroy the fungus spores. It is worth mentioning in this connection that the great cold storage warehouse for fish in Paris is under the Bourse, or Stock Exchange, and is managed by the compressed air company of the French metropolis. The freezing is done by means of compressed air, which in expanding generates cold, temperatures near zero or below that point being furnished as ordered to renters of rooms for preserving purposes. Practically the cost is so much a degree of cold supplied.—*London Fish Trades' Gazette.*

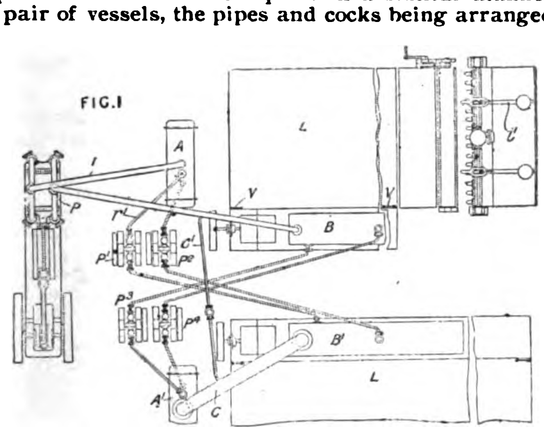
——Two dangers in the preservation of fruit in cold storage are pointed out by M. Firminhac, of Paris, France. If the temperature be brought too low, the piece is frozen and the consequent expansion bursts the skin, allowing the juices to escape on thawing. Again, if the temperature is not low enough, fermentation sets in, and decomposition is hastened. The dryness of the cold air also tends to deteriorate the fruit, as the extraction of moisture causes the fruit to collapse. To obviate this he recommends that the fruit be first placed for several days in a moderately dry air, allowing the juice to concentrate, with a temperature of from 35° to 37° F. After this process the fruit may be placed with safety in a dry air and at a temperature of 23° F. Further protection may be given by wrapping the fruits in tin foil or parchment.

FOREIGN PATENTS.

No. 17,419. Ice making and refrigerating. Petit, L., 12 Rue sur les Murs, La Rochelle (Loire Inferieure), France, August 12, 1899.

Relates to ammonia absorption apparatus with two absorbers A, A^1, two evaporators B, B^1, a double-acting gas pump P, and four single-acting pumps P^1, P^2, P^3, P^4 for liquid. Gas is taken from the evaporator by the pump P to the absorber A. The weak liquid from the evaporator B is transferred to the absorber A^1 by means of the pump P^3, while the pump P^2 removes strong liquor from the absorber A to the evaporator B^1. The second pair of vessels A^1, B^1 are connected by the gas pipe C, which is also connected through a pipe c^1 with the exhaust pipe to the pump P. The other pair of pumps serve to return the liquids in a similar manner to the first pair of vessels, the pipes and cocks being arranged as in-

FIG. 1



dicated in Fig. 1. A vertical section of the absorbers A, A^1 is shown in Fig. 2. The weak liquid from the pipe r^1 is sprayed by a rose under the gas inlet r, and then is distributed by a perforated plate M over a series of pipes through which cooling water is circulated. The evaporator has a similar perforated spreading plate over the pipes through which liquid to be

Fig. 2

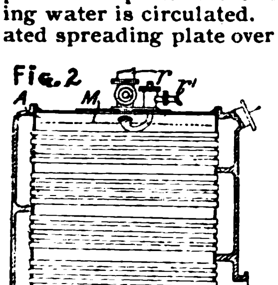
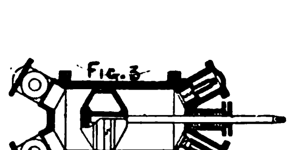


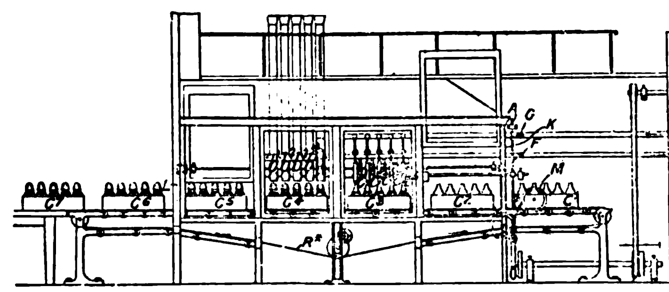
Fig. 3



cooled is circulated by a turbine, etc., T, the whole being immersed in a tank L, divided by a partition in which valves V are placed. A section of the pump is given in Fig. 3, showing a hollow piston and valves held on their seats by springs. The ice molds are supported by counterbalanced levers i^1, which close the water supply valve when they rise.

No. 15,152. Sterilizing and bottling liquids; ice making. Otto, M., 18 Avenue de Neuilly, Neuilly-sur-Seine, France. July 9, 1899.

Relates to apparatus for sterilizing and bottling liquids, such as water, wine, milk, beer and pharmaceutical prepara-



tions, and for the preparation of sterilized ice in blocks or in bottles. The liquid and the receptacle therefore are sterilized by means of ozone after the manner described in specification No. 15,151, A.D. 1898. The boxes C^1, C^2, C^3, etc. containing the bottles are conveyed into and out of a glazed chamber, containing the bottling and stoppering devices, by means of a belt, R^x, intermittently driven from a vertically reciprocating rod, A through ratchet gear M. The doors K and L, through which the boxes enter and leave the chamber, are automatically opened and closed at the proper moment by means of rack and pinion gearing actuated through bevel gearing from the rod A. This rod also automatically operates the cocks G and F, which supply the liquid and the ozone to the mixing devices t^1, t^2, t^3, etc. (described in the specification above referred to), and the devices which release the bottle caps or stoppers from the vertical tubes b^1, b^2, b^3, etc., which contain them. After leaving the bottling chamber, the bottles may be carried into a refrigerating chamber, in which they are cooled below freezing point. By substituting molds for the bottles, blocks of sterilized ice may be produced.

INTERNAL REVENUE DECISION.

THE commissioner of internal revenue, on December 7, 1899, gave a decision *in re* the Aerated Distilled Water Co., of Denver, Colo., which is of interest to many manufacturers of distilled water. It has been claimed that their product was subject to a stamp tax because it was labeled:

AERATED DISTILLED WATER.

Absolutely Pure. Preserves Health. Lengthens Life. Softens the Complexion.

And furthermore because in a booklet issued by the company appears the claim:

As a remedy. Eminent physicians tell us that not only can disease be prevented by the use of pure water, but many can also be cured by its free use. Particularly is this true of malaria, nervousness, kidney diseases, rheumatism, dyspepsia and indigestion.

Counsel for the company admitted that this water is advertised to preserve health, lengthen life and soften the complexion, but contends it should be classified as a food preparation. To which the commissioner responds as follows:

Upon careful consideration of all the facts submitted in this case, I am of the opinion that if the article put upon the market as aerated distilled water is a distillate of common hydrant, creek or river water, without the addition of any other substance, either before the process of distillation is commenced, during the process of distillation, or after the process of distillation is complete, that, irrespective of whatever remedial claims are made for it, it is nevertheless an uncompounded medicinal article, having a definite and known arrangement of molecules, H_2O, and, therefore, under the construction placed upon the law by Mr. Justice Brown, of the United States District court for the southern district of New York, it is entitled to the exemption provided under section 20, and it is so held.

Nor is aerated distilled water liable to stamp duty under the fifth paragraph of schedule B, because it is neither perfumery or a cosmetic, nor is it similar to these articles, or known or designated as such in commercial transactions.

THE following memoranda of projected ice factories and refrigerating plants, or of those in course of construction, and of improvements and betterments in existing plants, have come to our notice during the past month:

ALABAMA.

Gadsden.—The Queen City Electric Light Co., whose proposed improvement was mentioned in the December issue of ICE AND REFRIGERATION, has contracted with the Frick Co. of Waynesboro, Pa., for a 20-ton ice making plant, complete.

Huntsville.—S. B. Stewart, who is erecting a new ice plant, as mentioned in the December issue of ICE AND REFRIGERATION, is putting in a 10-ton York ice machine instead of a 6-ton, as first mentioned.

Montgomery.—The Alabama Ice Co., John R. O'Brien & Co., proprietors, is putting in a new 50-ton can ice making plant, the machinery for which will be supplied by the York Manufacturing Co. of York, Pa.

ARKANSAS.

Bentonville.—John D. Adams is in the market for both ice making and refrigerating machinery and requests correspondence from dealers in both new and second-hand machines.

Dardanelle.—It is reported that a company is being organized which proposes to erect and operate a 5-ton or 10-ton ice making plant. C. B. Cotton, of the Arkansas Valley Cotton Oil Co., can give particulars.

CALIFORNIA.

Red Bluff.—The D. S. Cone Ice and Refrigerating Co. is erecting a 10-ton ice making plant to be ready for operation by March 1, next. A cold storage warehouse, 40×85 feet in size, and equipped with the necessary machinery, is also to be erected. The freezing tank, coils, fixtures, etc., for the plant are to be supplied by Westinghouse, Church, Kerr & Co., of New York.

CANADA.

Napanee, Ont.—Thos. Symington has purchased dock property here, and proposes to erect thereon a plant for the cold storage of meat, produce, fruit, etc.

Nelson, B. C.—J. Y. Griffin & Co. are preparing to build a cold storage warehouse fronting the Canadian Pacific railway tracks.

St. Johns, N. B.—Architect R. C. J. Dunn is preparing plans for a cold storage plant, to be erected on Main street, here. The buildings will be 62×157 feet in size, with an ell 38×58 feet in size. Work on the construction is to begin early next spring. The estimated cost is given as $110,000.

COLORADO.

Denver.—The Retail Butchers' Protective Association has decided to erect an ice making plant in order to supply ice to its members at reduced prices.

Denver.—A. Coors, brewer, of Golden, Colo., is building a cold storage depot here, and will equip same with an 18-ton Linde refrigerating machine from the Fred W. Wolf Co., of Chicago.

Golden.—Adolph Coors, brewer, is improving his plant by the installation of a 50-ton Linde refrigerating machine, complete, supplied by the Fred W. Wolf Co., of Chicago.

CONNECTICUT.

Hartford.—P. Berry & Sons will erect a modern cold storage warehouse on a site 200×200 feet fronting on the N. Y., N. H. & Hartford R. R.

DELAWARE.

Seaford.—A stock company has been organized for the purpose of erecting and operating a plant for the manufacture of ice. Estimated cost of proposed plant, $30,000.

DISTRICT OF COLUMBIA.

Washington.—The American Ice Co., it is stated, is erecting a plant for the manufacture of ice on the site formerly owned by the Independent Ice Co., on the river, between Ninth and Tenth streets.

FLORIDA.

Jacksonville.—Herman Winters, of Savannah, Ga., it is stated, is organizing the Jacksonville Brewing Co., and intends to erect a brewery, ice making plant and electric light plant. Mr. Winter's address is Placide hotel, Jacksonville.

Magnolia Springs.—The Hotel Magnolia Springs is being equipped with an 8-ton refrigerating machine, supplied by the A. H. Barber Manufacturing Co., of Chicago.

Tampa.—Armour & Co., the Chicago packers, are building a large cold storage warehouse for packing house products at this point. Architect Kennerly is superintending the erection of the buildings.

GEORGIA.

Gainesville.—It is reported that a new plant for the manufacture of ice is to be erected here at an early date; capacity, twenty-five tons daily.

Quitman.—M. I. Harrell is erecting a 5-ton ice making plant, with cold storage attachment, at this place. It is stated that the machinery was purchased in Columbus, Ga.

ILLINOIS.

Chicago.—Christian Ickes will equip his packing house and market with a 6-ton direct connected refrigerating machine, contract for which has been awarded to the Creamery Package Manufacturing Co., Chicago.

INDIANA.

Atlanta.—The L. A. Orr Artificial Ice Co. has erected a plant for the manufacture of ice, and equipped it with a 5-ton ice machine, complete, with boiler and engine, put in by the A. H. Barber Maufacturing Co. of Chicago.

Terre Haute.—C. Neipp, proprietor of the Terre Haute house, has decided to equip his hostelry with a refrigerating plant, and has contracted with the A. H. Barber Manufacturing Co. of Chicago, for a 9-ton machine, to be installed by the middle of February.

Wabash.—A company has been organized with Charles Flinn as secretary for the purpose of building and operating a plant for the manufacture of ice.

INDIAN TERRITORY.

Durant.—S. D. McGee, of Dodd City, Tex., has purchased a site and commenced the erection of a 20-ton ice making plant, to be completed in May next.

Sulphur.—A company has been organized by D. H. Carr and T. F. Gafford, for the purpose of erecting and operating an ice making and electric lighting plant. Capital, $25,000. D. H. Carr is president of the company, J. N. Kirby, vice-president, and T. F. Gafford, secretary and treasurer. The company will be known as the Sulphur Ice, Light and Water Co. Construction will begin in January, and the plant is to be ready for operation by May 1, 1900. Bids are wanted on a 6-ton ice machine, plate system, dynamo and electric fixtures. Plant will be operated by water power.

IOWA.

Sioux City.—The International Packing Co., whose reconstruction of the old Silberhorn packing plant was noted in the November issue of ICE AND REFRIGERATION, has decided to equip the new plant with three 100-ton refrigerating machines, driven each by a compound Corliss engine. The machines, as well as the necessary direct expansion piping, will be supplied by the Vilter Manufacturing Co., of Milwaukee, Wis.

KENTUCKY.

Princeton.—C. W. Metcalfe is preparing to erect a 10-ton ice making plant, and has been securing estimates on machinery.

LOUISIANA.

Houma.—The Houma Lighting and Ice Manufacturing Co. intend to enlarge their plant and put in an additional 15-ton ice machine.

Morgan City.—A new ice making plant is being established by John Dalton, equipped with a 5-ton ice machine ordered from the A. H. Barber Manufacturing Co., of Chicago.

New Orleans.—The Home Ice Manufacturing and Distilled Water Co. have decided to increase the capacity of their ice plant from thirty to fifty tons. Contract for the machinery required for this increase has been awarded to the York Manufacturing Co., York, Pa., who installed the original plant one year ago. The plant is on the can system.

MASSACHUSETTS.

Boston.—The Westminster hotel is being equipped with a combined ice making and refrigerating plant by Westinghouse, Church, Kerr & Co., of New York.

Boston.—The proprietors of the Essex hotel have awarded a contract for a 12-ton refrigerating plant for the hotel, to Messrs. Westinghouse, Church, Kerr & Co., of New York.

Boston.—The board of health has called for bids on the construction of a new building, to be used as a morgue with accommodations for fifteen bodies, the building to be equipped with a refrigerating machine.

Springfield.—The Springfield Cold Storage Co., whose building improvement was mentioned in ICE AND REFRIGERATION for December, 1899, is putting in new machinery, including a 50-ton Polar absorption refrigerating machine, supplied by the Isbell-Porter Co., of Newark, N. J., which will double the former capacity, or give them a total of 600,000 cubic feet of cold storage capacity.

MICHIGAN.

Hancock.—The Bosch Brewing Co., of Lake Linden, Mich., is building a cold storage depot at Hancock, and will equip same with a 35-ton refrigerating machine, furnished by the Vilter Manufacturing Co., of Milwaukee.

Saginaw.—The erection of a cold storage plant, to be equipped with a 12-ton refrigerating machine, is contemplated by parties identified with the manufacture of mince meat, cheese, etc. Mr. Smart, president of the Board of Trade, or T. J. Norris can give particulars.

MINNESOTA.

Sleepy Eye.—The John Gund Brewing Co., of La Crosse, Wis., is erecting a cold storage house for the storage of beer.

St. Paul.—R. E. Cobb, whose cold storage plant was destroyed by fire recently, has rebuilt same and will put in a 14-ton refrigerating machine in place of the former 6-ton machine. The A. H. Barber Manufacturing Co. supplied both machines.

Winona.—The Northwestern Egg Co. is making preparations to build a modern cold storage plant here, to be equipped with machinery on the brine system, with forced ventilation.

MISSOURI.

Kansas City.—It is reported that a number of fruit and produce dealers are combining for the purpose of erecting a modern cold storage warehouse convenient to the produce trade. C. C. Clemons is said to be at the head of the enterprise. Nothing definite has as yet been concluded.

Kansas City.—The Cudahy Packing Co., who are putting up a new packing plant here, will equip the same with three 200-ton refrigerating machines driven by tandem compound Corliss engine. They will also put in an additional 40-ton ice making plant. All the machinery for this improvement will be supplied by the Vilter Manufacturing Co., of Milwaukee, Wis.

NEBRASKA.

Lexington.—The Lexington Potato Growers' Association has begun the erection of a cold storage house building, to be 75×75 feet in size, to be completed by March 1, 1900. Only one-half the space is to be used for refrigeration at the outset. A small refrigerating machine will be installed.

NEW JERSEY.

Atlantic City.—The Seaside Ice Manufacturing and Cold Storage Co. will erect an ice plant at this point. The York Manufacturing Co., York, Pa., has been awarded the contract for the necessary machinery. The plant will have a capacity of fifty tons of ice per day, and also an additional cold storage capacity. The plant will be complete in every particular, and embody all the latest improvements.

Long Branch.—The Atlantic Coast Ice Co., whose organization and proposed improvement was mentioned in the November issue of ICE AND REFRIGERATION, has decided, it is stated, to locate its proposed plant on Seventh avenue, near the Davis mill. The plant is to have a capacity of seventy-five tons of clear ice daily, and have 75,000 cubic feet of cold storage capacity. It is to be ready for operation by May 1, 1900. The board of directors of the company consists of M. F. Kahn, president; M. L. Bamman, vice-president; Geo. R. Lamb, secretary; Thomas R. Woolley, treasurer; Stewart Cook, C. A. Francis, Harry Blackmur, of Oceanport, and E. C. Hazard, of Shrewsbury.

NEW YORK.

Cortland.—T. E. Dye has purchased the Stevenson block and will fit up part of the structure as a cold storage plant.

Mount Vernon.—J. L. Reynolds is equipping his meat market with a 6-ton refrigerating machine, supplied by the A. H. Barber Manufacturing Co., of Chicago.

New York.—St. Joseph's asylum is to be equipped with an 8-ton refrigerating plant, contract for which has been made with the A. H. Barber Manufacturing Co., of Chicago.

New York.—Runkel Bros., chocolate manufacturers, are preparing to equip their factory with a 20-ton refrigerating plant, to be supplied by the Frick Co., of Waynesboro, Pa.

New York.—J. C. Cady, who has been in the ice business here for a number of years, has decided to erect a 50-ton ice making plant, and has contracted with the York Manufacturing Co., of York, Pa., for the machinery for such a plant, can system.

Northport.—Louis C. Scudder, ice dealer, has decided, it is stated, to put in a plant for the manufacture of ice.

Troy.—Roswell T. Brown is at the head of a company proposing to erect a new cold storage plant here, for which plans have been prepared. The company is to be known as the Troy Refrigerating Co. and be capitalized at $50,000, with privilege to increase to $150,000.

Watertown.—G. R. Easton & Co., of Lowville, will erect a cold storage warehouse here for the storage of cheese, butter, eggs, etc., the cheese room to have a capacity for 40,000 boxes of cheese. Buildings to be 50×155 feet in size. Plant to be completed by April 1, 1900, and to be operated by a company known as the Watertown Cold Storage Co. Ice will probably be used for refrigeration.

Yonkers.—D. Eifert will cool his meat hereafter by means of a 6-ton refrigerating machine, which the A. H. Barber Manufacturing Co., of Chicago, will put into his meat market.

NORTH CAROLINA.

Gastonia.—The Avon Mills Co. has decided to put in a plant for the manufacture of ice, and has already contracted with the Fred W. Wolf Co., of Chicago, for a 25-ton Linde ice machine and plant, complete.

Greensboro.—The Greensboro Ice and Coal Co., Wm. E. Worth, president, is replacing its old machine with a new 40-ton ice making plant, instead of a 50-ton plant, as stated in last month's issue of ICE AND REFRIGERATION. The improved plant is to be ready for operation by March 1.

Franklinton.—C. S. Williams is seeking estimates on machinery for the manufacture of ice.

Lincolnton.—John M. Motz is preparing to erect a 40-ton ice making plant, the machinery for which, it is stated, has been ordered.

Raleigh.—The Raleigh Ice and Electric Co. has been organized, and has purchased T. L. Eberhardt's ice making plant and will enlarge same and add a cold storage plant. The company is capitalized at $75,000, with privilege of increasing to $200,000. E. C. Hillyer, of Newport News, Va., and T. L. Eberhardt, of Raleigh, are the chief stockholders.

Rocky Mount.—The Southern Ice Co., Wm. E. Worth, president, is erecting an ice making plant of 50-tons daily capacity, to be ready for operation February 1. Mention of this improvement was made in last month's issue of ICE AND REFRIGERATION.

Salisbury.—The Salisbury Ice and Fuel Co. is putting in a new compressor and otherwise making improvements which will increase the capacity from ten tons to twenty-five tons per day.

Winston.—E. E. Ebert wishes to correspond with manufacturers of ice machinery and cold storage fittings.

OHIO.

Cambridge.—The Cambridge Ice and Cold Storage Co., recently organized, will equip their plant, now being erected, with a 50-ton refrigerating machine and a 20-ton ice making system, both to be supplied by the Frick Co., of Waynesboro, Pa.

Cincinnati.—Jacob Vogel & Son are equipping their packing house plant with a new 100-ton refrigerating machine, to be installed by the Frick Co., of Waynesboro, Pa.

Toledo.—A new company has been organized here, with $50,000 capital, to build and operate a cold storage plant. The company will be known as the Toledo Cold Storage Co., with Fred. O. Paddock, president; B. G. McMechen, vice-president; Jas. Hodge, treasurer; Porter Paddock, secretary, and J. W. Paddock, general manager. Plans for the new building have been prepared, and it is expected to have the plant in operation by April 1, 1900.

Winona.—The Winona Creamery Co. is preparing to equip its creamery with a 5-ton refrigerating plant, to be installed by the A. H. Barber Manufacturing Co., of Chicago.

PENNSYLVANIA.

Butler.—Architect C. W. Hodgdon, of Pittsburg, has prepared plans for an ice making plant to be erected here, and will supervise the construction.

Johnstown.—The Cambria Ice Co. has begun the erection of an addition to its plant, for storage purposes, etc. Size of new buildings, 68×123 feet.

Pittsburg.—Dunlevy & Bro., pork packers, will equip their packing house with refrigerating machinery of twenty-five tons' capacity, contract for which has been awarded to the York Manufacturing Co., of York, Pa.

Stroudsburg.—The Stroudsburg Brewing Co. is equipping its brewery with a 25-ton refrigerating machine, which was supplied by the Vilter Manufacturing Co., of Milwaukee.

SOUTH DAKOTA.

Lead.—The Fred Krug Brewing Co., of Omaha, Neb., is building a cold storage warehouse here, the building to cost about $3,000.

SOUTH CAROLINA.

Charleston.—The Citizens' Ice Co. has been organized here and incorporated with a capital stock of $50,000 by R. M. Anderson, J. B. Reeves and J. N. Nathan, Jr. A plant for the manufacture of ice is to be erected in time for next season's business.

Sumter.—The plant of the Sumter Electric Light and Ice Co., which was purchased by the bondholders, as mentioned in ICE AND REFRIGERATION for October, 1899, is being improved by the reorganized company. A new ice machine, of twenty-five tons' daily capacity, can system, is to be added, the contract for which was awarded to the York Manufacturing Co., of York, Pa.

TENNESSEE.

Brownsville.—The Locust Leaf Dairy Co., mention of whose improvement was made in the November issue of ICE AND REFRIGERATION, is equipping its creamery with a 7-ton refrigerating machine supplied by the A. H. Barber Manufacturing Co., of Chicago.

Fayetteville.—The Fayetteville Ice Co. will improve its plant by the addition of new machinery.

Memphis.—The Consumers' Ice Co. in further enlargement of their plant have contracted with the Frick Co., of Waynesboro, Pa., for a 50-ton ice making plant, complete.

Mt. Pleasant.—A new company has been organized here for the purpose of erecting and operating an ice making and cold storage plant.

Shelbyville.—It is reported that a Mr. Sugg, of Huntsville, Ala., is about to erect a 10-ton ice making plant at this point.

TEXAS.

Galveston.—The Red Snapper Fishing Co. is preparing to erect a cold storage and ice making plant, to be equipped with a machine capable of making twenty tons of ice per day and furnish twenty tons of refrigeration. There will be two sharp freezers, one with a capacity of 3,000 pounds and the other of 12,000 pounds of fish. There will also be four fish storage rooms, each capable of storing twenty-five tons of frozen fish. The main building to house the plant is already erected, and is 85×110 feet in size. Construction on the freezing plant will begin about January 15 and is to be completed by May 1, 1900.

New Braunfels.—Joseph Landa is putting in a 10-ton ice making plant, the machinery for which was supplied by the A. H. Barber Manufacturing Co., of Chicago.

San Antonio.—E. G. Holden, A. Seidel and others, it is stated, are organizing a company which proposes to erect a canning factory and cold storage plant.

San Antonio.—The Menger hotel, H. D. Kampmann, proprietor, will furnish its guests with all the benefits of refrigeration, having recently contracted with the Vilter Manufacturing Co., of Milwaukee, Wis., for a second 15-ton refrigerating machine, to be installed in the hotel.

VERMONT.

Burlington.—Smith, Wright & Sons, packers at Williston, Vt., have purchased ground at this point on which to erect a suitable freezing and cold storage plant.

Burlington.—The Burlington Cold Storage Co.'s plant is to be removed to a point near the storehouses of the Consumers' Ice Co., and an addition, 40×100 feet in size, erected. It is reported that a new company is to be formed to operate the plant.

VIRGINIA.

Charlottesville.—The Citizens Ice and Manufacturing Co., whose proposed new ice making plant was mentioned in ICE AND REFRIGERATION for October, 1899, has contracted with the Frick Co., of Waynesboro, Pa., for a 30-ton refrigerating machine and a 15-ton ice making system, to be erected by March 15 next.

Harrisonburg.—John E. Roller, it is stated, desires estimates, etc., from manufacturers of ice making machinery.

Lynchburg.—W. B. Quinn is at the head of a company proposing to equip and operate a cold storage plant.

Norfolk.—G. W. & E. T. Hopf, brewers, are about to put in a 20-ton refrigerating machine, supplied by the Frick Co., of Waynesboro, Pa.

Richmond.—J. R. Pace, the packer, whose new plant was mentioned in the October issue of ICE AND REFRIGERATION, will equip his new packing house with one 70-ton and two 25-ton refrigerating machines, contract for which was awarded to the Vilter Manufacturing Co., of Milwaukee.

WASHINGTON.

Seattle.—Swift & Co., packers, are engaged in making the necessary alterations in their building at 209 Jackson street to make it a cold storage warehouse for meats, etc.

Walla Walla.—Harry Burford and Charles Eagan are erecting a plant for the manufacture of ice. A 7½-ton ice machine will be put in.

WEST VIRGINIA.

Morgantown.—Luther L. Douthat will erect an ice making plant of five or ten tons' capacity, and is receiving estimates on ice and refrigerating machinery.

WISCONSIN.

Manitowoc.—The Cudahy Packing Co., of Milwaukee, intends to erect here, it is stated, a cold storage warehouse for dressed meats.

Milwaukee.—Louis E. Vogel, of 125 West Water street, Milwaukee, is preparing to erect a plant for the manufacture of ice, construction to begin January 1, 1900, and be completed in May. Two 25-ton ice machines, with distilling apparatus, will be needed.

Monroe.—The Anglo-Swiss Condensed Milk Co. will equip its creamery with a 6-ton refrigerating machine, contract for which was awarded to the A. H. Barber Manufacturing Co., of Chicago.

——The Vilter Manufacturing Co., of Milwaukee, Wis., report having recently supplied one of their 115-ton refrigerating machines to the Ruemmeli & Siebert Refrigerating Machine Co., of St. Louis; also sold to E. Atkins & Co., of Boston, for export to Cuba, a 400-pound ice making plant, and another plant of same size to De Ford & Co., of Boston, also for export to Cuba, and shipped a 1-ton ice plant and refrigerator to D. Manuel, Jalapa, Mexico. The Vilter company have also put a lot of direct expansion piping in the packing house of Nelson Morris & Co., of Chicago, in the Grand Rapids Brewing Co., of Grand Rapids, Mich., and other plants.

NEW INCORPORATIONS.

——The Consumers' Ice Co., Charleston, S. C., has filed notice of increase of capital from $6,000 to $15,000.

——The Macon Ice, Power and Light Co., of Macon, Miss., has been incorporated, with a capital of $50,000.

——Bates Ice Co., Portland, Me., has been incorporated by C. J. Bates, J. Chisholm, W. L. Delano, all of Portland. Capital, $10,000.

——The Citizens' Ice Co., Charleston, S. C., has been incorporated by R. M. Anderson, J. B. Reeves and J. N. Nathans, Jr. Capital, $50,000.

——Gallatin Ice Co., Gallatin, Tenn., was incorporated December 14, by D. R. Spillings, C. Levy, H. Orman, S. W. Lord and John Temple. Capital, $9,000.

——The John Zobrist Refrigerator and Ventilating Co., of Hanford, Va., has been incorporated by J. Zobrist, W. J. Burnett, R. E. Tiffany, A. M. Fredericks and others. Capital, $250,000.

——The Merchants Ice and Cold Storage Delivery Co., San Francisco, Cal. Capital authorized, $100,000. H. W. Westphal, G. W. Morse, Frank Dalton, W. Hersfelder and C. H. Westphal, directors.

——The Raleigh Ice, Cold Storage and Electric Co., Raleigh, N C., was incorporated December 12. Capital, paid up, $75,000. E. C. Hillyer, president; T. L. Eberhardt, manager; B. S. Jerman, treasurer.

——The Torrington Ice Co., Torrington, Conn., to harvest, manufacture and deal in ice, has been incorporated with a capital of $17,000. E. A. Hotchkiss, president; Geo. M. Braman, secretary; F. A. Pickett, treasurer.

FIRE AND ACCIDENT RECORD.

——The Passaic Beef Co.'s plant at Passaic, N. J., was destroyed by fire November 26. Loss, $50,000.

——McElroy Bros.' cold storage and packing plant at Bridgeport, Conn., was burned December 5. Loss, about $80,000 to $90,000.

——The plant of the North Amherst Packing Co., North Amherst, Ohio, was burned December 12. Loss, $10,000. Insurance, $5,000.

——The old buildings of the Fort Worth (Tex.), Ice Works were destroyed by fire November 30. Most of the machinery had been removed. Loss about $3,000.

——The St. Augustine Ice Works, St. Augustine, Fla., J. W. Simmons, proprietor, was destroyed by fire December 5. Loss, $45,000. Partly insured. The plant will be rebuilt at once.

——An ice house belonging to D. G. Aitken, of Cohoes, N. Y., was blown down and demolished by the gale of December 12. The house was 100×80 feet in size, built of frame. It will be rebuilt.

——The plant of the Carbon County Improvement Co. at Weissport, Pa., including the ice factory and electric plant, was destroyed by fire December 6. Loss between $75,000 and $100,000. The plant is to be rebuilt.

FRIGIFEROUS PARTICULARS.

——The Crescent Ice Co., New Orleans, La., is putting in three sets of wagon platform scales, ordered from the Chicago Scale Co., Chicago, Ill.

——The Maine Provision and Cold Storage Co., of Portland, Me., John H. Vose, president, which was affiliated with the John P. Squire Co., packers, of Boston, Mass., made an assignment December 16, to H. W. Chaplin.

——The North avenue ice palace, at Baltimore, Md., has been sold to David Ambach, head of the clothing firm of Ambach Bros. & Co., Baltimore, who, it is stated, will reconstruct the property and convert it into a cold storage market warehouse. The price paid for the property was $65,000. As an ice skating rink the "Palace" had proved a success for several years, when the machinery was removed and a floor put in for roller skating which had then become a fad. With the decline of that pastime the company failed.

——The East Florida Ice Manufacturing Co., of Ocala, Fla., has just completed a cold storage room for meats, vegetables, etc., a room large enough to accommodate 30,000 to 40,000 pounds of meat at one time. The room, it is stated, is provided with a series of "pigeon holes" about the walls for the accommodation of individual customers. The walls of the room are about three feet thick, and are built of matched lumber, four layers of waterproof paper, twelve inches of space filled with sawdust, with a 4-inch air chamber on each side.

——The requirements of a modern hotel in a large city are numerous and diversified. Thus the Waldorf-Astoria mechanical equipment includes a steam plant with a boiler capacity of 4,000 horse power, electric generators capable of developing 1,500 kilowatts, with 25,000 electric lights, a refrigerating plant having a cooling capacity equal to the melting of 150 tons of ice per day, pumps sufficient to handle the water supply for a city of 400,000 inhabitants, 152 steam and 102 water cylinders and fifty-six electric motors, and a force of 116 men in the engineers' department.—*Exchange.*

ARRANGEMENTS are being made to have a great national convention of butter makers at Kansas City, Mo., in January, 1901. The national Association meets at Lincoln, Neb., in January, and strenuous efforts are to be made to induce the Association to accept the convention proposition.

THE *United States Experiment Station Record* quotes from H. Atwood's writings, where a number of churning experiments are reported with cream from deep setting, which was cooled to different temperatures and either held there for some time or churned almost immediately. Where the cream was cooled too rapidly or was not held at the low temperature a sufficient time "the globules in the cream were still too soft for good results, and this explains the reason for the larger amount of fat left in the buttermilk and the shorter time required for churning." This result was verified in a number of other experiments. "The hardness of the fat globules of milk at any particular time does not depend entirely upon the temperature of the globules at that time, but is influenced materially by the previous temperature of the globules. In other words, the hardness or softness of the fat globules changes more slowly than the change in temperature of the milk or cream when this change is somewhat rapid."

A SIMPLE method of preserving milk fresh for from fifteen to twenty days is given in the *Milch Zeitung*. It is recommended that a portion of the milk to be preserved be frozen into a block as soon as possible after milking. If the block frozen weighs, say, from twenty to thirty pounds, it will be sufficient to preserve from 100 to 120 gallons of milk. The fresh milk should be poured over the frozen block of milk placed in a suitable vessel, and this vessel closely shut, though not necessarily air tight. The frozen block will, of course, rise to the top and soon forms a granular mass over the surface of the milk. This, in gradually thawing, serves to create sufficient agitation in the milk to prevent the separation or rising of cream, and maintains the milk in its original fresh condition for the period of time above specified.

CREAMERY ITEMS.

——The Breedsville Creamery Co, of Breedsville, Mich., has been organized, with a capital of $3,750.

——The Burlington Creamery Co., of Burlington, Kan., has been incorporated with a capital stock of $10,000.

——C.H. Allen, of Mercer, Me., is building an ice house preparatory to the erection of a creamery and dairy plant.

——The American Dairy Company, of St. Louis, Mo., has been incorporated by J. Walter, A. Ashland, J. G. Steinlage, A. Steinlage, A. A. Meyer, H. Nagel, all of St. Louis. Capital, $25,000.

——Edward L. Kempf, of Chicago, is to be the manager of a creamery company recently organized and incorporated with a capital of $200,000, to operate in Chicago, with branches in various parts of the city.

——The Brookdale Creamery Co., of Chicago, has been incorporated with a capital of $10,000, to carry and deal in butter, eggs, etc. The corporators are Chas. A. Tinkham, Ignatius Stapleton and A. W. Merrill.

——A new creamery is to be erected at Holden, Utah, next spring, with A. Stephenson, manager of the Co-operation Co. of Holden, in charge. He will manage the new enterprise. The creamery will be owned by local capitalists.

——Efforts are being made at Brenham, Tex., to organize a company with $40,000 capital, for the purpose of erecting and operating a creamery and cheese factory. H. E. Taylor, with Giddings & Giddings, can give particulars.

——The Carrabassett Butter factory has been organized at East New Portland, Me., and are building an ice house and will erect a butter factory in the spring. H. F. Weymouth is president, and A. S. Parsons, secretary of the company.

——During the year ending June 30, 1899, New Zealand, Australasia, exported butter to the value of £451,269 ($2,265,345), as against £250,885 ($1,254,425) four years ago. The total dairy products exported during the past fiscal year amounted to £578,500 ($2,892,500).

——The Pocahontas Creamery and Cold Storage Co., Pocahontas, Ark., has been incorporated with a capital stock of $10,000. Officers were elected as follows: B. F. Biggers, president; H. A. Peters, vice-president; M. M. Carter, secretary, and Antoine House, treasurer.

——A co-operative creamery company has been formed by thirty-seven citizens of Williamsburg, Iowa, who have subscribed an aggregate of $3,750 and have begun the erection of a new creamery plant. Henry Newkirk, Fred Swarting, H. Dormann and George Trimpie are on the building committee.

——A very large creamery establishment is to be perfected at Sioux City, Iowa, according to report. It is to use 100,000,000 pounds of milk annually, and make 20,000 pounds of butter a day. It will get its cream from 250 local leased creameries, where the cream will be separated, pasteurized and shipped to the central plant.

——The Sauk Rapids Co-operative Creamery Co. has been organized at Sauk Rapids, Minn., and officers elected as follows: P. W. Lahr, president; E. S. Hall, vice-president; A. Cummings, secretary; H. Berg, treasurer. The company will at once erect a plant to care for the milk from 1,000 to 1,500 cows, and equip same with suitable machinery.

——At the West Virginia agricultural experiment station at Morgantown, remarkable results have been obtained through the application of high pressures to milk inclosed cylinders. The effect of the pressure is greatly to increase the length of time during which the milk can be preserved. The general conclusions from the experiments are that pressures from thirty up to 100 tons per square inch will postpone the souring of milk for twenty-four hours. Thirty tons' pressure continued for one hour generally delays the souring just about twenty-four hours. A similar pressure continued for ten or twelve hours preserves the milk for from three to five days. Ninety tons' pressure for one hour postpones souring for four days.—*Youth's Companion.*

ICY ITEMS.

——The Chicago Pipe Line Refrigerating Co., at Chicago, Ill., has been incorporated with a capital of $100,000.

——The Crystal Springs Ice Co., of Glen Cove, N. Y., is preparing for new improvements, and proposes to increase its capital from $12,000 to $25,000.

——The City Manufacturing Co., Chicago, Ill., is improving its plant by the addition of a 16-ton wagon platform scale, supplied by the Chicago Scale Co.

——The Minneapolis Cold Storage Co., Minneapolis, Minn., is equipping its plant with direct expansion piping supplied by the Fred W. Wolf Co., of Chicago.

——The City Ice Manufacturing Co., of Chicago, will put twelve delivery wagons in service in the spring. Heretofore the product of this factory has been disposed of to peddlers at the platform.

——The People's Ice Works, D. J. Boynton, manager, at Athens, Ga., is to be ready for operation and begin ice making on January 1, 1900. The plant will have a capacity of twelve tons of ice daily.

——The York Manufacturing Co., York, Pa., has sold through the American Trading Co., of New York, one of their latest improved can ice making plants, which will be shipped for erection in Kobe, Japan.

——The Topeka (Kan.) Ice and Cold Storage Co. have put in a new independent electric light plant for use in their establishment. They are also erecting a new smoke stack and otherwise improving the premises.

——The Montgomery Ice Co., the Montgomery Brewery and the Abercrombie Ice and Coal Co. have been consolidated and are to be operated as a single concern, with C. G. Abercrombie, president, T. H. Moore, secretary, and J. Kirk Jackson treasurer.

——All the property, franchises, etc., of the Virginia Ice Co., at Charlottesville, Va., have been purchased by a syndicate made up chiefly of the owners of the Charlottesville City and Suburban railway, and Mr. J. C. Rixey, of Culpeper, who will operate the plant.

PACKERS PROSPEROUS.

THE packing industry of the United States, which received an unwonted stimulus during the Spanish-American war, is again profiting by the war in South Africa. According to a representative of one of the large packing houses in Chicago, the orders given by the British government to American packing houses for shipment to South Africa prior to December 15, 1899, amounted in the aggregate to over 100,000,000 cans of tinned meats. There are over 100,000 British soldiers to feed in South Africa, and the resources of the English packers, even when reinforced by the Australasian houses, are insufficient for the demand. There is also a reasonable inference that the British government is so well satisfied with the superiority of American meats that it prefers these, even at much higher prices, to the Australasian. These extensive orders also serve to prove, if indeed any further proof were needed, how very little grounds existed for the charges brought against the meat products supplied to the commissary department during the war in Cuba and Porto Rico. The British were evidently not alarmed by the so called "exposures" of the packing house methods or of the inferiority of canned beef.

SOME interesting statistics regarding the world's meat supply have been going the rounds of the foreign press recently, based chiefly upon the report by a member of the British Board of Agriculture. According to these reports there are to-day more cattle per 1,000 acres in every country of the world than there were thirty years ago, but the increase in cattle has not been proportional to the increase in population. In the principal European countries the increase in population during this period was 24 per cent, while the increase in herds and flocks was given as 21 per cent. In America, it was claimed, the number of cattle per 1,000 of the population had fallen from 589 to 365, or from a total of 37,000,000 cattle in 1888 to less than 28,000,000 in 1898. In Australasia it is claimed similar facts are found. Thus in New South Wales the number of cattle per head of the population had decreased by more than one-half. In New Zealand and West Australia there was a large decrease, while Queensland and Victoria showed an increase. The decrease in sheep is even more marked. In Germany the number of sheep per head of the population is but one-third of what it was twenty years ago. In Belgium but one-fourth; in Holland, Switzerland and Hungary but one-half. In the United States there were 1,060 sheep per thousand of the population in 1888, and but 537 in 1898. In the Australian colonies alone and in South Africa is there shown an increase in the number of sheep, the increase in Australasia being from 51,000,000 to 103,000,000.

PACKING HOUSE NOTES.

——The Sherman Packing Co., Sherman, Tex., has increased its capital from $25,000 to $50,000.

——Adolph Schneider will build a sausage factory at Winona, Minn. It will be a first-class concern of its kind.

——It is reported that the Cudahy Packing Co., of Milwaukee, is about to establish a branch in Manitowoc, Wis.

——It is stated that Ninemire & Morgan, wholesale and retail butchers, of Montesano, Wash., have decided to build a cold storage plant.

——The Armour Packing Co., of Kansas City, Mo., it is stated, is making preparations to establish a branch plant at Middleborough, Ky.

——Swift & Co., packers, Chicago, Ill., will erect a storage building 150×35 feet in size, at Peoria, Ill. The cost of the structure is given as about $25,000.

——The Hays Packing Co. of Gainesville, Tex., has increased its capital stock from $25,000 to $50,000. The purpose of the increase is to extend the capacity of the plant of the company.

——The Crescent City Stock Yards and Slaughterhouse Co., Ltd., of New Orleans, La., proposes to erect a packing house plant in the near future. A. B. Blakemore is the general manager.

——It is reported that the Union stock yards at Richmond, Va., will be ready for business on December 15, and that the Richmond abattoir, a large adjunct undertaking, will begin operation on January 15.

——Plans have been approved for the erection in Albany, N. Y., of a building for Armour & Co. Size of building, 131×84 feet, two stories high. The structure will include the offices, meat storage rooms and smoke house.

——The Hoefer packing plant at St. Joseph, Mo., has been badly damaged by fire. The loss is estimated at $25,000. The total insurance is about $12,000. The principal machinery and a portion of the stock were destroyed.

——A. C. Cooper is completing a large abattoir and ice house at Rochelle, Ill. The ice house is large enough to provide for storage of 400 tons of ice, to furnish cold storage for ninety beeves. The slaughtery has a capacity for twenty-five hogs an hour.

——The Frye-Bruhn Co., packers at Seattle, Wash., whose plant was destroyed by fire September 15, has taken out a permit for a new structure, to cost $50,000. The foundation is already in, and work on the superstructure will be pushed as rapidly as possible.

——The Peters Packing Co., of Portland, Me., has been incorporated with a capital of $125,000. The officers of the company are T. C. Davis, president, Hudson, Mass.; W. F. Putnam, treasurer, Danvers, Mass. The purpose of the company is to pack lobsters.

——An international live stock exposition, to be held in Chicago, Ill., in December, 1900, is proposed, which shall include an exhibition of packing house methods and appliances, and of all meat food products and the refrigerating apparatus used in preserving them.

——The Krug Packing Co., of St. Joseph, Mo., has under consideration the removal of its plant to South St. Joe. If they do not remove to the larger plant, enlargement and improvements in the present plant will be necessary. The contemplated additions would cost about $100,000.

——Plans have been completed for the new market house to be erected at Columbus, Ohio. The plans provide for a two-story fireproof structure, 480×187 feet in size, the first floor to contain 400 stalls, the second 125 stalls. The cost of the building is given as about $200,000. It will be constructed and owned by the city of Columbus.

——Swift & Co., packers, Chicago, are putting in a branch plant, with smoke houses, storage rooms, ice plant, etc., at Seattle, Wash. It is stated that Armours will also secure and equip a large cold storage warehouse there, and that Seattle is to be made a central point not only for the northwest trade, but also as a point of shipment to the Philippines.

——A train load of dressed beef en route from Chicago to New York, consigned to Sir Redvers Buller in South Africa, passed through Cumberland, Md., recently. All the beef was put up in such cans as are used in artificial ice plants, and will not be changed on the steamer. The cargo was valued at $250,000. The English government, since the Boer war began, has purchased of American packers 300,000 cases of canned meats, or 70,000,000 cans. Of this amount one-third has been shipped, one-third is being shipped, and the remaining one-third is to be forwarded as soon as it can be delivered and inspected. The meat is all reinspected before going on board ship at New York.—*National Provisioner.*

——The Consolidated Ice Co., at Philadelphia, Pa., is preparing to put in a 125-ton ammonia condenser, contract for which was awarded to the Fred W. Wolf Co., of Chicago.

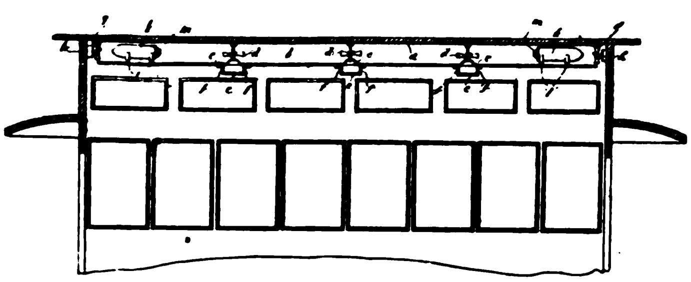
——The Lake Superior Produce Co., Hancock, Mich., has completed its new cold storage warehouse, built of Portage Entry sandstone, and equipped with modern machinery.

WE append below the most important new patents relating to the ice, ice making, refrigerating-cold storage and kindred trades that have been issued from the patent office during the past month, reported expressly for ICE AND REFRIGERATION. All inquiries relative to patents or trade marks in the United States and foreign countries should be addressed to William S. Beaman, counsellor at law and solicitor of patents, 99 Cedar street, New York city.

AIR COOLING DEVICE.

No. 637,383. Thomas H. Gore, West Hoboken, N. J. Filed April 18, 1899. Serial No. 713,454. Patented November 21, 1899. (No model.)

Claim.—1. A device of the class described, comprising an oblong casing, supports placed therein, an oblong receptacle

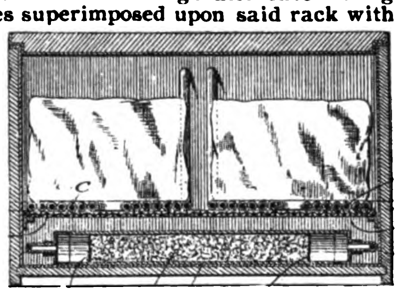


mounted therein on said supports, and conical and pointed at one end, and provided with a detachable cap or head at the other end, said casing being open at the ends, and provided with a fan by which the air is forced thereinto and therethrough, substantially as shown and described.

APPARATUS FOR COOLING AND PURIFYING AIR UNDER PRESSURE.

No. 638,327. Joseph Geisenberger, Philadelphia, Pa. Filed May 5, 1898. Serial No. 679,838. Patented December 5, 1899. (No model.)

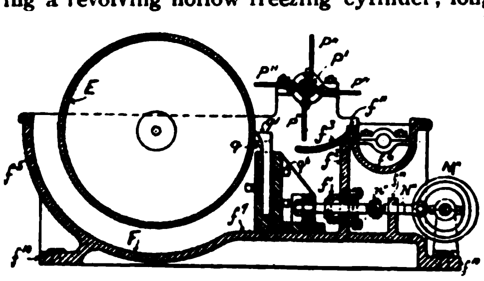
Claim.—The combination with a refrigerator case having an ice rack, a coil of pipes superimposed upon said rack with the end thereof extending through the sides of the case and adapted to communicate with suitable supply and delivery pipes, of a plurality of communicating purifying chambers situated below said ice rack, said chambers being provided with packing, strainers or guards at the ends of said chambers, the first of said chambers communicating with a source supplying air under pressure, and the last of said chambers being provided with an outlet leading to a place of service.



ICE MAKING AND CUTTING MACHINE.

No. 638,577. Charles B. Harris, New York, N. Y. Filed April 12, 1899. Serial No. 712,802. Patented December 5, 1899. (No model.)

Claim.—1. An ice making and cutting machine comprising a revolving hollow freezing cylinder; long hollow bearings for said cylinder, with stuffing boxes secured thereto; a cleanable water trough with ends constituting combined bearings and stuffing boxes; a perforated supply pipe with valve; knife holders with knives securely held in vertical pockets with adjusting plates and screws; a cam shaft with grooved cams, one half of the said grooves being concentric with center of cam shaft, and other half flattened and closer to center of said shaft, spindles with forked ends and rollers, transmitting movements from grooved cams to knife holders, turn buckles to vary the lengths of the spindle with forked ends, a gear wheel secured to hollow bearing of revolving cylinder, bevel gears with shaft and pillow blocks to transmit motion from revolving cylinder to cam shaft, revolving blades and conveyor, all as substantially described.



TRADE CORRESPONDENCE.

SUGGESTIONS BY READERS OF ICE AND REFRIGERATION—TO PREVENT ODORS IN ICE.

[The publishers of ICE AND REFRIGERATION do not hold themselves responsible for the opinions expressed by correspondents on any topic; but these columns are at all times open for the discussion of subjects of interest to the trade, and such correspondence is at all times welcomed. Our readers are cordially invited to contribute to this department, by giving their views on questions propounded, or by suggesting original topics for trade discussion, or notes on the condition of trade in their section of the country. Anonymous letters will receive no attention whatever. Parties who desire to communicate with correspondents will address them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago.—ED.]

TO PREVENT ODORS IN ICE.

JERSEY CITY, N. J., December 5, 1899.

To the Editor: On page 402 of the December number of ICE AND REFRIGERATION, there is an article headed "Pure Exhaust Steam." It touches on the difficulties in the use of exhaust steam for ice making purposes, and the unpleasant odors and even scum due to the lubricating [material used on the engine.

We have had quite a number of letters addressed to us by parties who have experienced similar difficulties.

Following our own experience in the lubrication of engine cylinders, we have recommended the use of a pure flake graphite. Graphite is as wholesome and healthful in every way as charcoal. It is not affected by any degree of heat nor by acids or alkalies. A pure flake graphite will attach itself to the walls of the engine cylinders, forming a veneer-like coating of unequaled smoothness. If not used to excess it will seldom or never be carried over to the exhaust. We believe that experiments along this line of lubrication will be found pleasing and surprisingly satisfactory, and we shall be very glad at any time to offer any information that we can.

Truly, JOS. DIXON CRUCIBLE CO.

TRADE LITERATURE.

A SECOND edition of the lecture by Walter B. Snow, on "The Influence of Mechanical Draft upon the Ultimate Efficiency of Steam Boilers," has just been issued by the B. F. Sturtevant Co. of Boston, Mass., by whom copies will be sent upon application.

MESSRS. Ernecke & Salmstein, of Chicago, Ill., the well known manufacturers of special paints, are sending out a new edition of their "red book," containing some references from customers using their refrigerating pipe paint and Victor condenser paint. Copies may be obtained on application.

THE Arctic Machine Co., Cuyahoga building, Cleveland, Ohio, calls attention to work of the ice and refrigerating machines made by this concern, in an illustrated 24-page catalogue, recently issued. The Arctic machine has been on the market for over twenty years, and the work done by many of the machines in actual service is described in the catalogue. A copy of same for reference may be had on application.

THE Goodsell Packing Co., 33 Canal street, Chicago, Ill., have just issued their new catalogue for 1900. In this convenient little booklet are illustrated and described the various kinds of packings for "piston rod," or "ammonia sleeve" or "pumps," etc., as well as the gaskets and a new substance, said to be heat proof, "never hardens in steam joints," etc., and termed "rubberbestos." A copy of the catalogue may be had on application.

A NEW catalogue of fittings and supplies in most demand by users of ice making and refrigerating machinery was issued December 1, 1899, by the Pennsylvania Iron Works Co., Philadelphia, Pa. Especially attractive are the cuts, etc., of unions, couplings, return bends, ammonia coils, manifolds, etc., while also the automatic can filler, keystone water filter, steam condenser, etc., are shown, with prices. A copy may be obtained by addressing the house as above.

CATALOGUE "E," issued by the Remington Machine Co., of Wilmington, Del., has been received and contains a very

lucid description of the methods employed and the ice and refrigerating machinery manufactured by this old established house. Description of the brine system and direct expansion system is given and notice made of insulation and of small ice machines. Numerous tables and fine illustrations make the catalogue attractive. It will no doubt be accepted as a valued bit of literature by the trade.

WANTED AND FOR SALE ADVERTISEMENTS.

[The charge for advertisements in this column is $2 each insertion for seventy words or less, and twenty-five cents for each additional fourteen words. No advertisements will be inserted unless accompanied by the necessary cash. Parties answering these advertisements must write to the addresses given, as the publishers decline to furnish any information concerning them.]

Second Hand Ice Machine Wanted.

WANTED.--A good second-hand 25 to 35-ton ice machine in good condition. FRYE-BRUHN CO., Seattle, Wash.

Ice Machine for Sale.

A 10-ton second-hand Blymyer absorption ice machine, complete, for sale cheap for cash. Address MORRIS ICE CO., Jackson, Miss.

Ice Plant for Sale.

FOR SALE.--Five ton ice plant complete or in part, such as compressor 3-ton, ice cans, pipe, valves, manifolds, pumps, boiler, brine tank, etc. Address J. C. ROGERS & CO., Wamego, Kan.

Ice Machine for Sale.

FOR SALE.—One 4-ton Blymyer ice making machine, complete and in first-class condition, cheap. Reason for selling machine, too small. For particulars write N. L. LEE, Demopolis, Ala.

Second-Hand Refrigerating Machine Wanted.

WANTED.—Second-hand refrigerating machine; 50-ton. The following makes preferred: De La Vergne. Frick, Arctic or York. Address THE F. BARTELLS BREWING CO., Cincinnati, Ohio.

Ice Machine for Sale.

A 30-ton absorption ice machine in good order will be sold at a bargain, it being replaced by a larger machine. For further particulars address "C. S. C.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Situation Wanted.

WANTED.—Situation for 1900 by first-class compression ice engineer; 25 years experience; can go any place on short notice; large plant preferred. Address "COMPRESSION 25," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Ice Plant for Sale.

FOR SALE.—30-ton ice making plant, Hercules make, now in operation in good Illinois town, in good running order. Will sell the plant complete with buildings and land or machinery and apparatus for removal. Address JOHN LEVEY, 1019 Manadnock Building, Chicago.

Position Wanted.

WANTED.—A position as manager or chief engineer. Thoroughly conversant with all types of compression machines; also electrical engineer. Will take some stock if satisfactory. Have charge of plant at present, but desire to change. Address "C. M.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Traveling Salesmen.

WANTED.—Traveling salesmen visiting breweries, ice factories, cold storage warehouses, etc., who are desirous of increasing their income by taking a side line of staple goods of particular merit, for which there is a quick sale at refrigerating plants (not requiring the carrying of samples). Commission 20 per cent and 20 per cent. Address "FACTORY," P. O. Box 153, Covington, Ky.

Ice Plant for Sale.

FOR SALE.—A 5-ton plant in first-class order in a good town in Georgia. No competition and can sell entire product; about two acres of land with plant: also wagons and everything complete. There is good money here for a good man. Good reasons for selling. Don't answer unless you mean business. Address "BARGAIN," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Position Wanted.

A position as manager and superintendent of an ice plant. Have had 15 years' experience in the ice business for myself, and understand the business thoroughly. Have operated both compression and absorption machines; would accept a position as engineer in a large plant where a good salary would be paid. Am competent to take charge of and manage any ice plant. Can give reference as to my ability, character, etc. Address "G. A. S.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Elliott's Durable Ice Machine Black

CONDUCTOR OF HEAT AND COLD

For Condenser Pipes, Freezing Cans, Brine and Ammonia Pipes, Hot Pipes and Boiler Fronts.

Used by 125 ice plants. No bad odor. Can be depended on to dry hard in four hours.

Samples gladly sent prepaid and gratis. Price, 75 cents per gallon. No charge for cans. In barrel lots we pay the freight.

We are absolutely certain that this material is better and costs more to make than any of the other Blacks sold at fancy prices for Ice Machine and Ice Can painting.

Elliott Varnish Co.

(INCORPORATED)

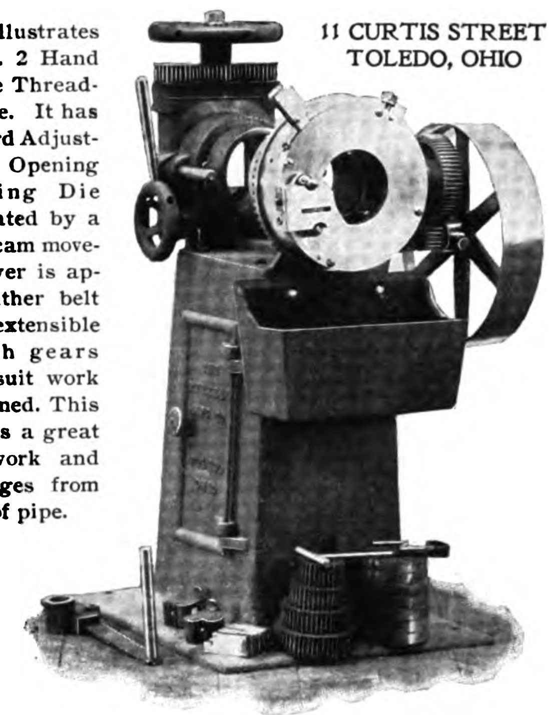
Jefferson and Fulton Streets
CHICAGO

MERRELL MFG. CO.

Manufacturers of **Pipe Threading and Cutting Machines**

11 CURTIS STREET
TOLEDO, OHIO

THIS cut illustrates our No. 2 Hand Power Pipe Threading Machine. It has our Standard Adjustable Quick Opening and Closing Die Head, actuated by a convenient cam movement. Power is applied by either belt wheel or extensible crank, with gears graded to suit work to be performed. This machine has a great range of work and quick changes from size to size of pipe.



For full particulars, send for handsomely Illustrated Catalogue.

SEE CHANGE OF COPY AND CUT IN THIS SPACE NEXT ISSUE

ILLINOIS ENGRAVING COMPANY.

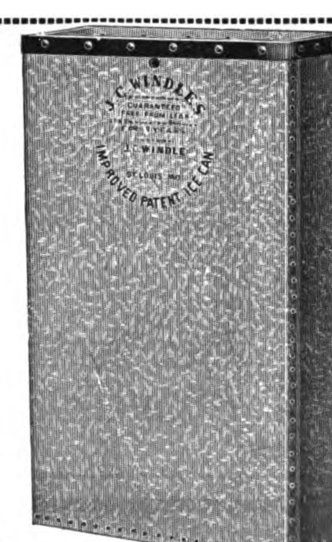
MAKERS OF ILLUSTRATIONS BY ALL PROCESSES.

DESIGNING
WOOD-ENGRAVING
HALF-TONE AND
ZINC-ETCHING

350 DEARBORN ST
CHICAGO.

THE WINDLE PATENT

Steel Ice Cans



The most perfect Can made. Cannot leak.
Put my Improved Bottom in your old Cans.
All kinds of TANK WORK,
CONDUCTOR PIPE and EAVE TROUGH.

Missouri Sheet Metal Ornament Co.

621-623 North First Street, ST. LOUIS, MO.

CLEAR ICE
AND How to Obtain it

THE INTERNATIONAL FILTER IS INDISPENSABLE TO THE UP-TO-DATE ICE MANUFACTURERS.....

CAPACITY: 40 to 50 tons in 24 hours from storage tank through filter to ice cans.

Connected with the Storage Tank, the water passing through the Filter into the freezing can is freed from all dust, rust, oil, etc. No device you may now be using for this purpose can take the place of **our filter**, whose object is to remove all foreign matter, which previously there was no way of arresting.

Easy to apply to any plant.
Simple to operate.
Requires little attention.
Occupies small space.

Also specially adapted for filtering distilled water for bottling purposes, insuring a perfectly brilliant water.

The Consumers Company.

CHICAGO, ILL., Sept 30, 1898.

INTERNATIONAL FILTER CO., 1702 Wabash Ave.

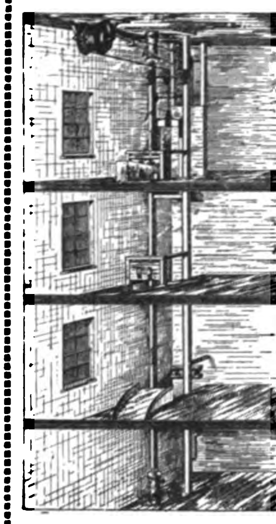
Gentlemen:—The eight International Filters we purchased of you have been in use at our Ice and Cold Storage Plant since last March, and at all times have given the best of satisfaction.

Before using your filters we had some difficulty in keeping our ice clean and free from dust and specks; but since we have adopted your machines in connection with our charcoal filters, etc., have had no trouble, our ice at all times showing up clean and free from any discoloration.

Yours truly, (Signed) C. B. FAIR,
Mechanical Supt. The Consumers Company

Send for Circular and Prices.

International Filter Co.
1702 Wabash Avenue, CHICAGO, ILL.



Automatic Conveyors
Without Motive Power

Ice Elevators
of any description for storage, and

Ice Releasing Apparatus

H. MOCK & CO.
Patentees and Mfrs.
171 E. 92d St.
NEW YORK

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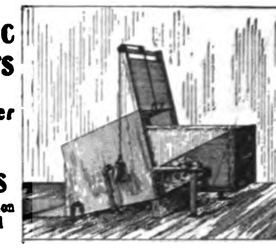
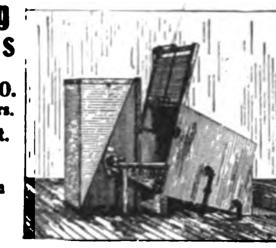




STRICTLY UP-TO-DATE

A PATENT AND IMPROVED METHOD OF PLATE AND BLOCK ICE FREEZING, without artificial circulation or agitation of the freezing water.

The ice is free from air needles, uniform in thickness and quality, and freezes more rapidly, thus increasing the capacity of the plant and avoiding the operation of a pump, air compressor or other steam or power consuming apparatus.

UNAGITATED WATER FREEZING COMPANY
Walnut Lane Station, PHILADELPHIA, PA.

B. P. CLAPP AMMONIA COMPANY,

MANUFACTURERS OF

ABSOLUTELY PURE **LIQUID ANHYDROUS AMMONIA**
26° AQUA AMMONIA

CONTAINING 29¼ PER CENT OF AMMONIA.

FOR REFRIGERATING PURPOSES AND THE TRADE

General Offices, 245 Broadway, **NEW YORK.**

HERF & FRERICHS CHEMICAL CO.
ST. LOUIS, MO.

MANUFACTURERS OF **Liquid Anhydrous Ammonia**

Our Ammonia can be had of the following:

NEW YORK—Herf & Frerichs Chemical Co., 188 William St.
CHICAGO—Westerlin & Campbell.
F. K. Higbie.
Newberry Warehouse and Storage Co., 79 Kinzie St.
CLEVELAND, OHIO—Cleveland Brewers Supply Co.
DENVER, COLO.—Bridaham-Quereau & Co.
DETROIT, MICH.—Farrand, Williams & Clark.
HOUSTON, TEX.—D. M. Garvin, Lone Star Oil Co.
KANSAS CITY, MO.—Abner Hood.
LOUISVILLE, KY.—Kentucky Malt and Grain Co.
NEW ORLEANS, LA.—Behrens & Douglass. 840 Fulton St.
INDIANAPOLIS, IND. Holt Ice and Cold Storage Co.
ATLANTA, GA.—Fred W. Wolf Co.

ABSOLUTELY DRY, PURE AND UNIFORM ALL THE YEAR ROUND

26° Ammonia SPECIALLY PURIFIED FOR ABSORPTION MACHINES

All our Ammonia is made from **SULPHATE AMMONIA only.**
Large capacity, best qualities and quick shipments.

SOMETHING ENTIRELY NEW

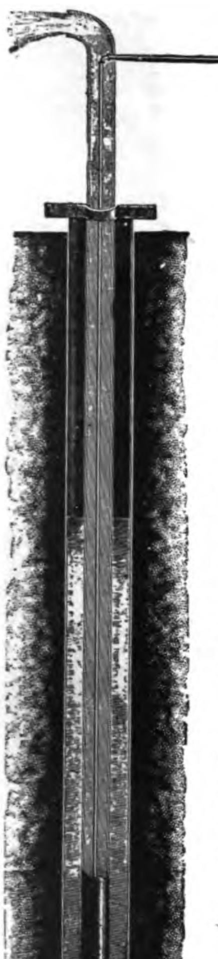
FOR ALL THOSE INTERESTED IN PUMPING LARGE QUANTITIES OF

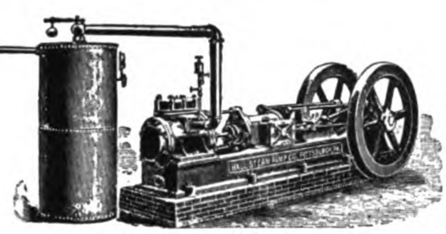
WATER

FULL PARTICULARS IN OUR LATEST PAMPHLET.

Pneumatic Engineering Co.

100 Broadway, NEW YORK.





THE HALL STEAM PUMP CO.'S

Air Lift Well Pump

BEST SYSTEM FOR PUMPING WATER FROM ARTESIAN OR OTHER WELLS.

Special Advantages: This system dispenses with working barrels, valves, sucker rods and leather cups, which require constant attention and repair.

NO MOVING PARTS used in the well, consequently there is no wear.

A largely **INCREASED** output of water, with a largely **DECREASED** expenditure of power.

No freezing of pipes possible.

OUTPUT FROM ARTESIAN WELLS

Pumped by this system will average from 6-inch wells, 75 to 100 gallons per minute; 8-inch wells, 150 to 500 gallons per minute; 10-inch wells, 300 to 750 gallons per minute, depending only on the productiveness of the well.

Should one well not produce sufficient water, the compressed air from a single compressor may be divided among a number of wells located apart, lifting from each well all the water it can produce

Write for estimate and give the following information:

1—Depth of well. 2—Diameter of well. 3—Depth of water level below the surface when not pumping. 4—Depth of water level below the surface when well is pumped at full capacity. 5—Estimated capacity of well. 6—Elevation above surface to which the water is to be raised.

Plants Erected on a Full Guarantee of Efficient Working.

HALL STEAM PUMP CO.

MANUFACTURERS OF

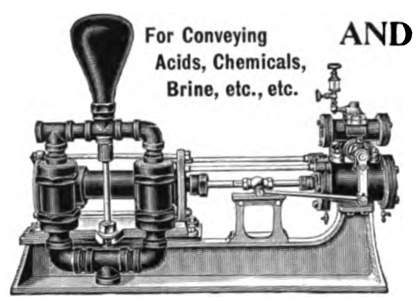
Steam Pumps, Single or Duplex, and Air Compressors.

OFFICE AND WORKS, GRANT AVE., NEAR UNION BRIDGE,
P. O. Address, Box 351, Pittsburgh, Pa.
CORRESPONDENCE SOLICITED.

ALLEGHENY, PA.

ACID PUMPS

For Conveying Acids, Chemicals, Brine, etc., etc.



AND **FITTINGS**

Made of

HARD RUBBER

American Hard Rubber Co., New York.

A. D. COOK

MANUFACTURER OF IMPROVED . . .

Tube Well Supplies

COOK'S PATENT—

TUBE WELL STRAINERS

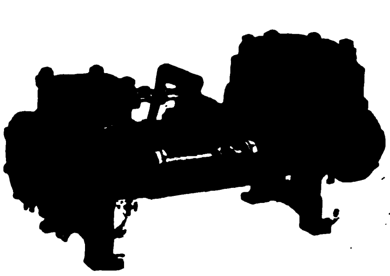
AND STEAM PUMPS . .

A SPECIALTY.

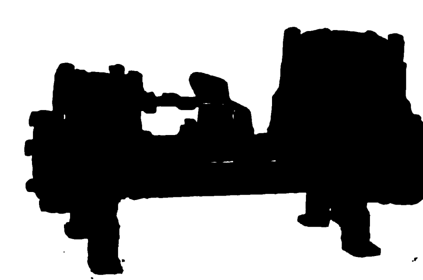
LAWRENCEBURG, IND.

STEAM PUMPS

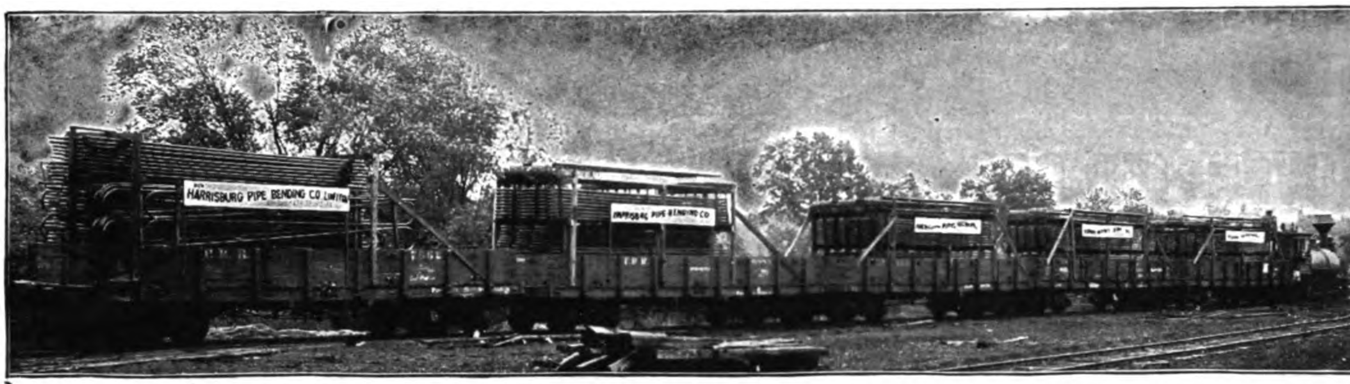
ARE IMPORTANT COMPONENTS IN ICE FACTORIES



Manufacturers should see that they get good quality for their money. A poor pump will prove to be quite a costly experiment. Better get the best at the start. Get a **GARDNER**. Made with especial reference to **severe service**, and will **outlast other makes**. It has many superior features, all of which are fully explained in Catalogue XX. Mailed on request.

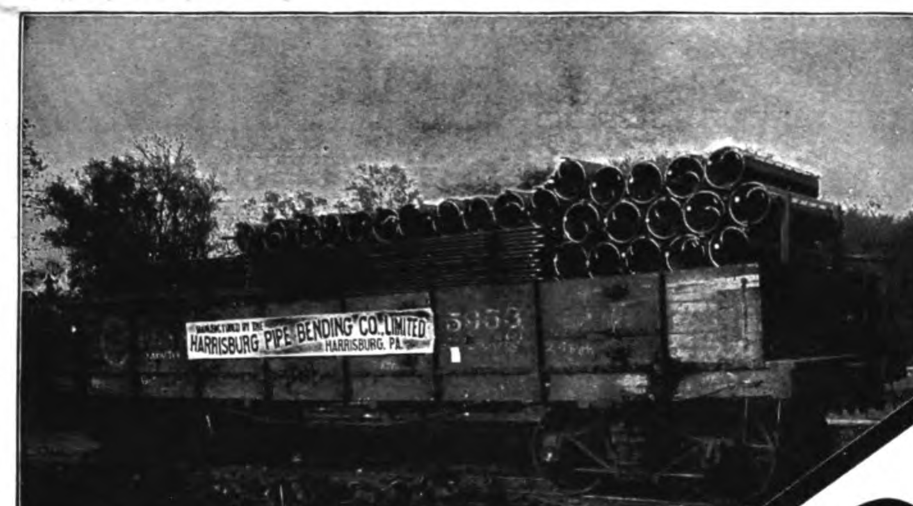


THE GARDNER GOVERNOR CO., Quincy, Ill.



IRON
COPPER
BRASS

COILS



Bends and **Manifolds**

FOR
ALL
PURPOSES

Wrought Iron Ammonia Cocks

Ammonia Valves and

Fittings

Harrisburg Pipe

STILLS and
ABSORBERS

FOR ABSORPTION AMMONIA
ICE AND REFRIGERATING MACHINES

SPECIAL ATTENTION GIVEN TO REPAIRS FOR
EXISTING ICE MACHINES

Wheeler Condenser and Engineering Co.

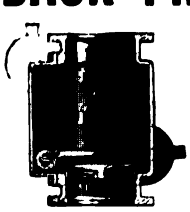
120 and 122 LIBERTY STREET, NEW YORK

Barnard Water-Cooling Tower

WHEELER SURFACE CONDENSERS

Send for Catalogues. WHEELER FEED WATER HEATERS

EXCELSIOR STRAIGHT-WAY BACK PRESSURE VALVE



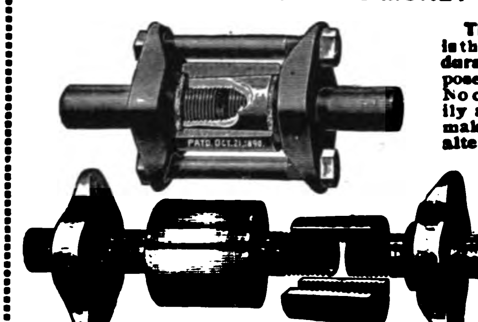
This valve has no dash pots, springs, guides or complicated levers to get out of order. It is simple, reliable and well made. Never sticks, and can be relied upon at all times when using exhaust steam for heating; or when used as a relief, or free exhaust on a condensing plant, it has no equal. It is noiseless and free from any complicated attachments.

JENKINS BROTHERS,

NEW YORK. PHILADELPHIA. BOSTON. CHICAGO.

Use the CLIMAX COUPLING

IF YOU WISH TO SAVE MONEY AND LABOR.



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THE CLIMAX COUPLING is the cheapest, best and most durable joint for all purposes, especially ammonia. No coupling can be so speedily attached or detached, making it invaluable for alterations and repairs.

Write for further Information, Testimonials and Prices.

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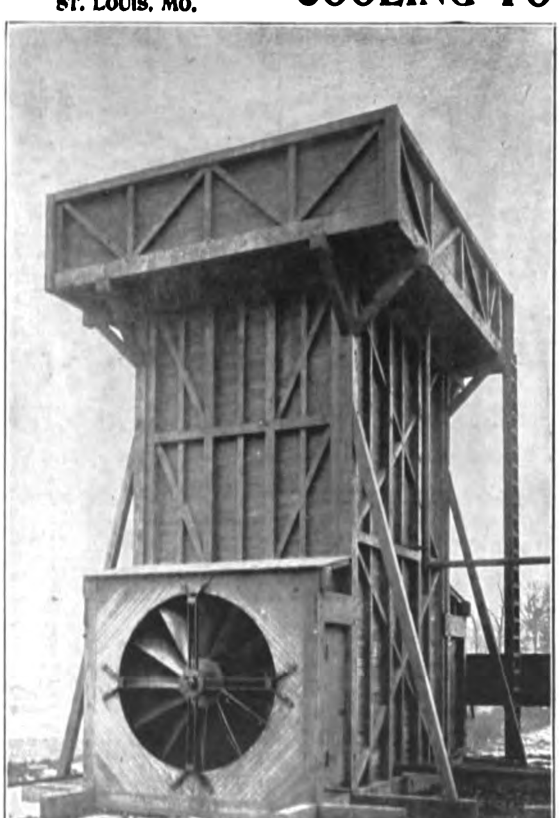
MANUFACTURER OF

COOLING TOWERS

PATENT JOHN STOCKER



Apparatus for the Re-Cooling of Ammonia and Steam Condenser Water.

SAVES FROM 90 to 95 PER CENT of the Water Required for Condensing and Cooling Purposes.

Owing to the superior construction of the cooling surfaces (about 40 per cent larger than with the Gradirworks, patent Klein) and the most perfect methods of distributing the water, the efficiency of this Cooling Tower is greater than with any other in the market, and the temperatures obtained considerably lower. References from leading firms all over the United States. Information and estimates, etc., cheerfully furnished.

STURTEVANT ELECTRIC FANS

16

In 100 types and sizes.
Special designs for requirements.
We build both fan and motor.
Send for Bulletin H.

B. F. STURTEVANT CO. BOSTON.
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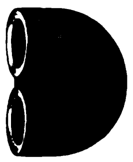
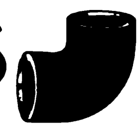
STEEL FITTINGS

FOR



ICE MACHINES



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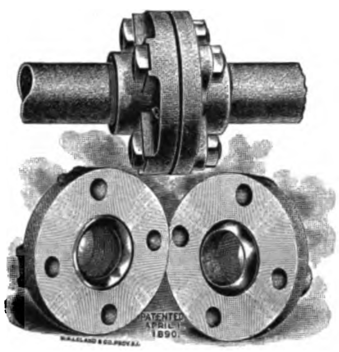
STANLEY G. FLAGG & CO.

220 Broadway, NEW YORK.

19th St. and Penna Ave. PHILADELPHIA.

Dart Patent Peerless Flange Union



No Packing required.
Ground Bronze Seats.
Perfect Alignment of Pipes not necessary.

POINTS

Adapted for High Pressure.
Absolutely Tight Joints assured.
Section of Piping easily removed.
No old Packing to scrape from Flanges.
Thousands in use working finely.

Write for Prices and Discounts. Manufactured by

E. M. DART MFG. CO., Providence, R. I.

THE BEST AND MOST EFFICIENT

EVAPORATOR

SINGLE, DOUBLE AND TRIPLE EFFECT.

For making pure water out of salt or other impregnated water

FOR ICE MAKING PLANTS.

JAMES REILLY REPAIR AND SUPPLY CO

229-230 WEST ST., NEW YORK.

ESTABLISHED 1867. INCORPORATED 1882

AMMONIA COCKS, GATES, ETC.

WHY NOT BUY THE BEST

Vulcanized-Asbestos Packed Iron Cocks with Gland Ends for Ammonia.

These are the Only Reliable Ammonia Valves on the Market.

Also Asbestos Discs, Valves of all kinds for Steam.

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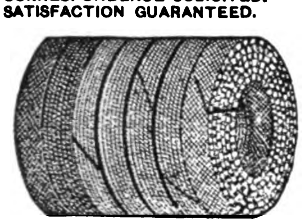
CORRESPONDENCE SOLICITED.
SATISFACTION GUARANTEED.



MONITOR RING PACKING

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Special Packings

For Steam, Water, Ammonia, Gas.

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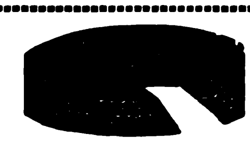
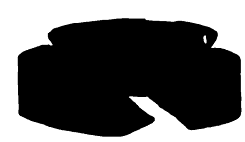




WATERPROOF SPECIAL

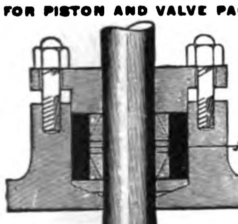
GUILLOTT METAL GASKET CO.'S METALLIC PACKING

FOR

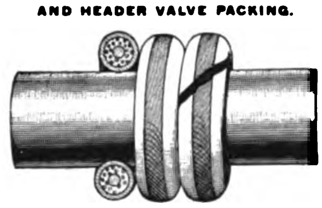
Piston Rod and Valve Packing, Combination Stop Valve and Header Valve Packing — The best, safest and most durable Packing on the market.

No disconnection of rod necessary; no change in mechanism required. Can be applied in ten minutes.

FOR PISTON AND VALVE PACKING.

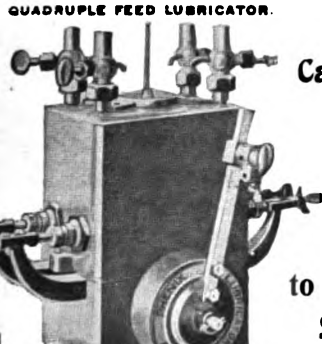


METALLIC COMBINATION STOP VALVE AND HEADER VALVE PACKING.



QUADRUPLE FEED LUBRICATOR.

Lubricating Pumps



The Greatest in the World

Can be applied to any Engine, and is Guaranteed to give Perfect Satisfaction.

Our METAL MAN and HAND HOLE GASKETS for Boilers Have No Equal

Corrugated copper gaskets in all sizes. Write for prices.

GUILLOTT METAL GASKET CO.

84 MARKET STREET .. .. CHICAGO

Save Your Piston Rods

By using Garlock Packings. They are manufactured of high grade material, honestly made, and well adapted for every purpose.

ADVANTAGES

Self-Lubricating.
Slight Wear.
Light Pressure.
Reduces Friction.
Requires Little Attention.
Never Injures or Cuts the Rod.

Nothing experimental in its use, it meets all requirements. Send for catalogue and samples to nearest office.

The Garlock Packing Co.

NONE GENUINE WITHOUT IT

TRADE Garlock MARK

New York, Boston, Chicago, Philadelphia

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COAT YOUR PIPES

WITH

Poindexter's Anti=Calamine

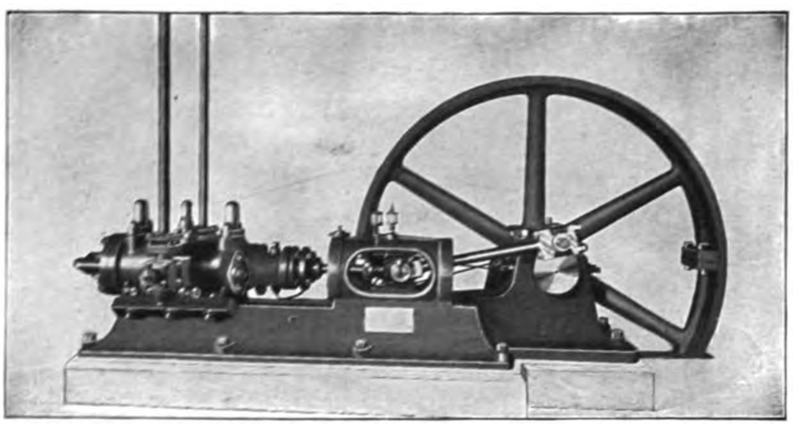
AND SAVE THEM FROM RUST.

NO INSULATION AGAINST FROST.

HARDENS AND SOFTENS BY TEMPERATURE ONLY.

THE ANTI-CALAMINE CO., Fulton and Union Sts., CHICAGO, U. S. A.

CARBONIC ANHYDRIDE ICE AND REFRIGERATING MACHINE



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MANUFACTURED BY

Kroeschell Bros. Ice Machine Co.

29-39 Erie Street, CHICAGO, ILL.

Most simple, economical and durable. Applicable to all commercial purposes.

Complete installation for Ice Factories, Breweries, Cold Storage, Packing and Slaughter Houses, Hotels, Restaurants, Candy Factories. Also for Liquefaction of Carbonic Acid Gas.

No destructive fumes or poisonous gases. Complete safety of operation through the introduction of our safety device. Over 1,000 machines now in use.

STARR ENGINEERING CO.

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Specialists in Refrigeration and Pure Water Apparatus.

Complete Cold Storage Installations.
Street Pipe Line Refrigeration.
Ice Plants.

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A. H. BARBER MFG. CO.

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CHICAGO, ILL.

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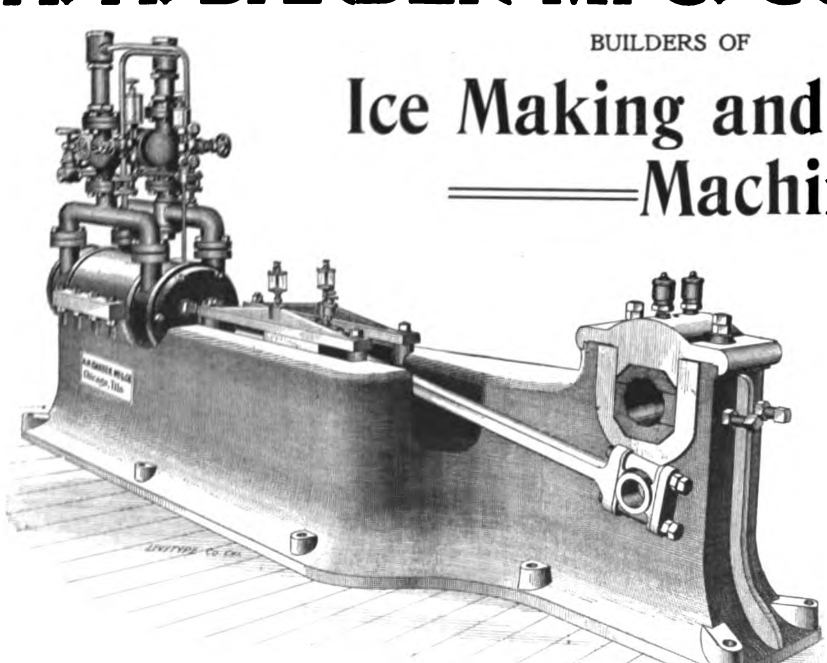
Ice Making and Refrigerating Machinery



30 TO 50-TON DIRECT CONNECTED COMPRESSOR.

ESPECIALLY ADAPTED FOR

ICE FACTORIES, HOTELS, RESTAURANTS, MEAT MARKETS, SMALL BREWERIES, BEER DEPOTS, and COLD STORAGE PLANTS.

Between 400 and 500 in Successful Operation.

CAN BE RUN BY

BELT, DYNAMO, GAS ENGINE, or Direct Connection with Steam Engine.

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NEW YORK OFFICE,
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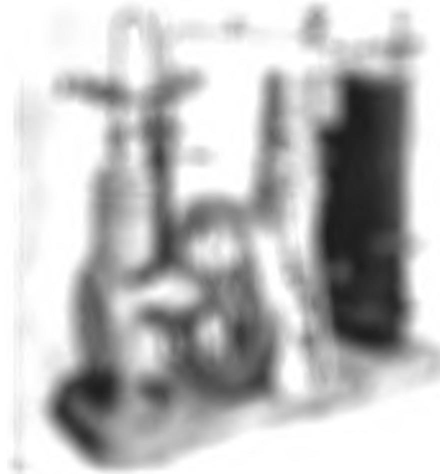
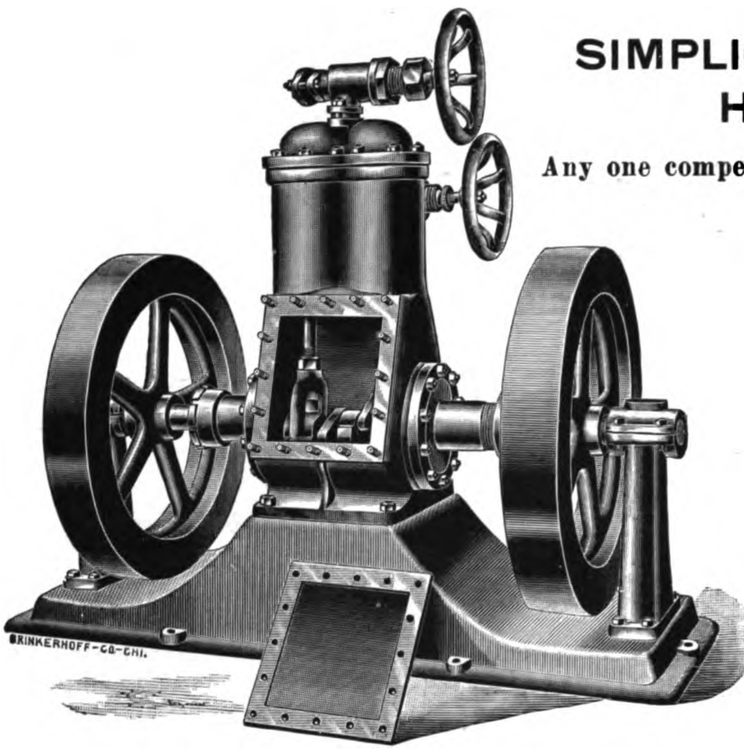


The Ideal

CHALLONER Perfected Ice and Refrigerating Machines



THREE-TON COMPRESSOR.

SIMPLICITY, DURABILITY, HIGHEST EFFICIENCY.

Any one competent to operate motive power can operate them.

FLOHR-WALTER CANDY CO.
Manufacturing Confectioners, 114, 116, 118 Walnut St.,
ST. LOUIS, August 16, 1897.

GEO. CHALLONER'S SONS CO., Oshkosh, Wis.

Gentlemen: We have your letter of August 14. In reply we are pleased to report that our refrigerating plant is working very satisfactorily. Our chocolate department, cooling room and cold water tanks have given us the required temperature during the hottest kind of weather, and we shall be pleased to testify to the efficiency of your system at any time. Yours respectfully,

FLOHR-WALTER CANDY CO.

We build and install plants from 1 ton up to 25 tons refrigeration.

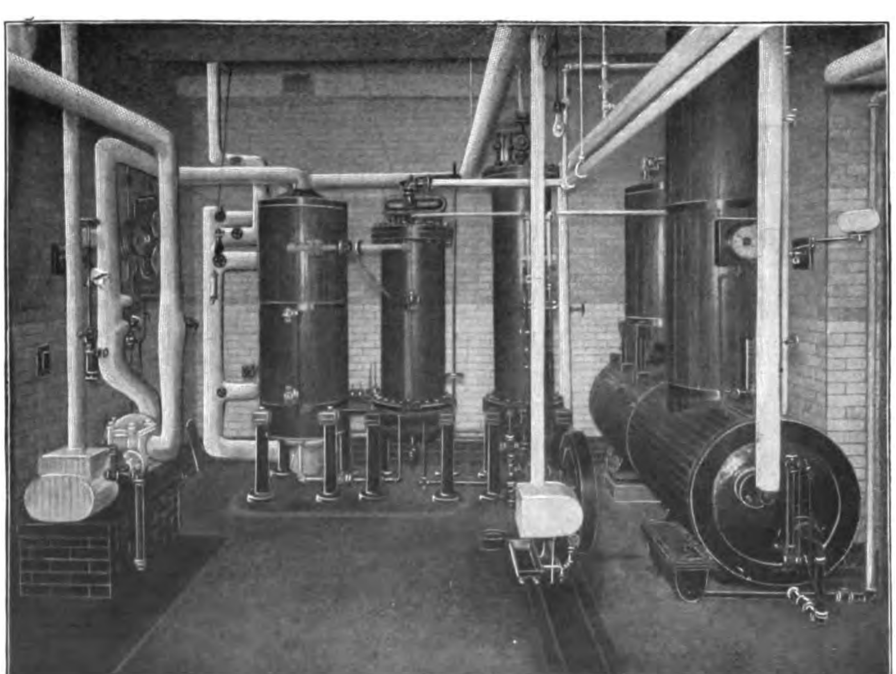
SATISFACTION GUARANTEED OR NO PAY.

WE WANT YOUR BUSINESS.
WRITE US FOR ESTIMATES.

GEO. CHALLONER'S SONS CO. ENGINEERS AND FOUNDERS . . . 33 Osceola St., OSHKOSH, WIS.

ISBELL-PORTER COMPANY

Engineers and Founders



OFFICE AND WORKS
NEWARK, N. J.

New York Office,
245 Broadway, New York City.

BUILDERS OF THE

POLAR

Absorption Refrigerating and Ice Making Machine

For Direct Expansion or Brine Circulation.

MACHINES IN OPERATION IN CAPACITIES UP TO 150 TONS PER DAY EACH.

POLAR BRINE COOLERS
POLAR CONDENSERS } For Compression Plants

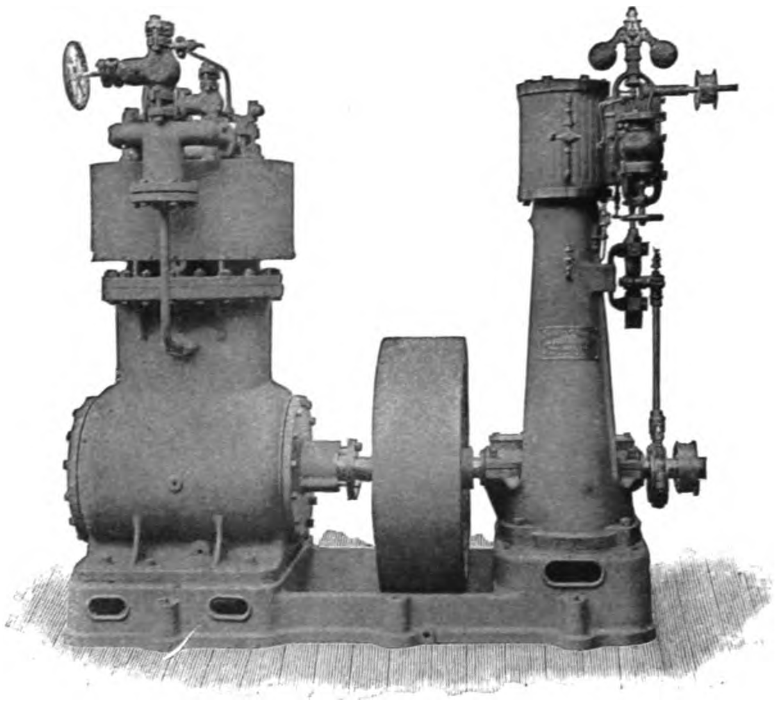
ESTIMATES, drawings and specifications furnished for complete plants or for alterations and improvements, and for the equipment of direct expansion plants with brine coolers.

Refrigerating Machinery

Arctic Ice Machines

REMINGTON

Ice Making and Refrigerating Machinery



REMINGTON DOUBLE CYLINDER ICE MACHINE

Complete Plants Erected and Guaranteed.
Ice Making by Can and Plate System.
Pure Ice Made from Sea Water.
Refrigeration by Brine Circulation and Direct Expansion Systems.

Ammonia Compressors..

Horizontal Double Acting, of Large Capacity, with Corliss and Slide Valve Engines.
Vertical Single Acting, of Small Capacity, with Engine Direct Connected, and with Fly Wheel Pulleys for Belt Power.

CATALOGUES AND ESTIMATES UPON APPLICATION

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SOLE PACIFIC COAST AGENTS.
NEW YORK OFFICE, 136 LIBERTY ST.

Remington Machine Co.

WILMINGTON, DEL., U. S. A.

W. R. NIFONG, SALES AGENT, 932 W. KING'S HIGHWAY, ST. LOUIS, MO.

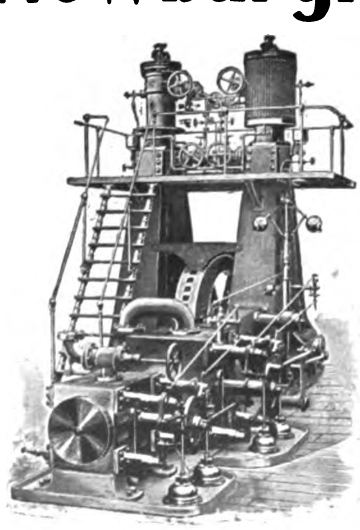
EDGAR PENNEY, PRESIDENT AND MANAGER. ROBERT WHITEHILL, SEC. AND TREAS.
A. B. WHITNEY, VICE-PRESIDENT. GEO. B. SALISBURY, AUDITOR.

OFFICE AND WORKS, NEWBURGH, N. Y.

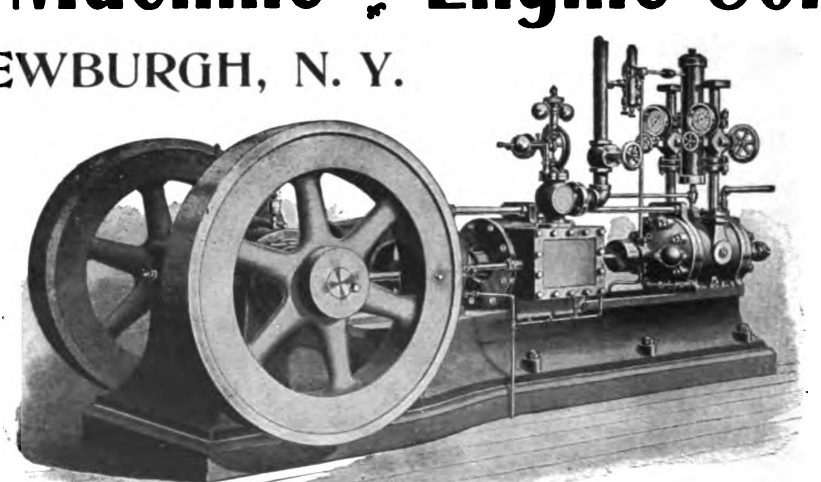
PENNEY'S AMMONIA ICE MACHINES — WHITEHILL CORLISS ENGINES
NEWBURGH ICE MACHINE AND ENGINE CO. NEWBURGH, N.Y.
OUR NEW PICTET-OXIDE SYSTEMS — STEAM POWER PLANTS

Newburgh Ice Machine and Engine Co.

NEWBURGH, N. Y.



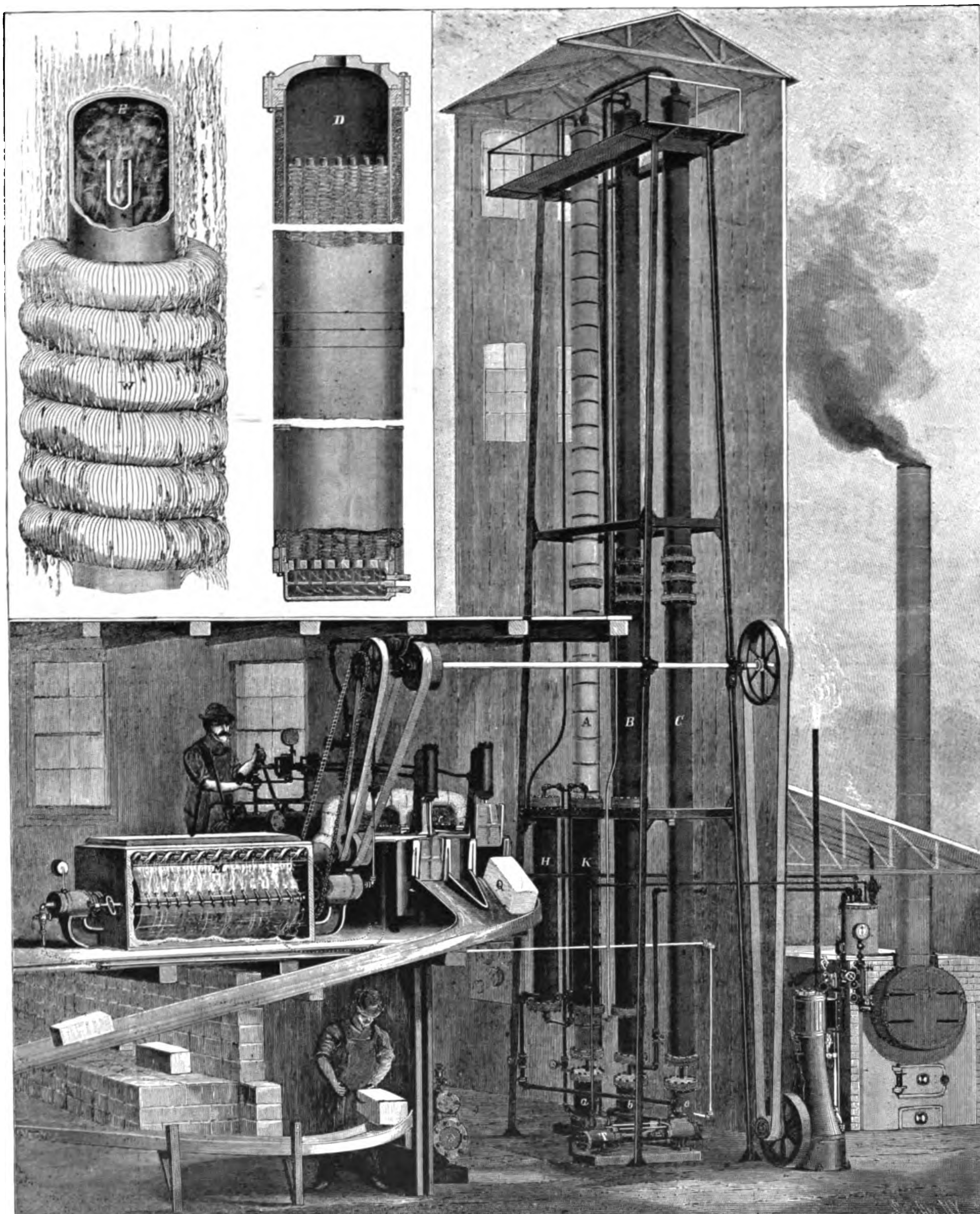
Penney's Patent Vertical Single Acting Duplex Refrigerating Machine.



Penney's Perfected Horizontal Double Acting Ice Machine.

The Regealed Ice Machine

MANUFACTURED SOLELY BY ✣ ✣ ✣ **D. L. HOLDEN** 1336 BEACH ST. ✣ ✣ PHILADELPHIA, PA.



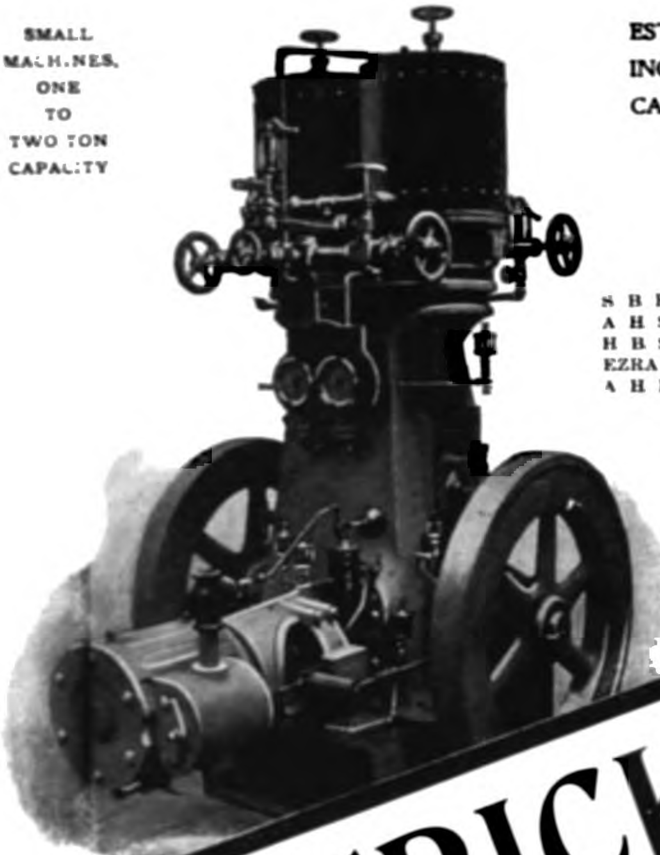
Makes Ice at 50 Cts. a Ton

THE FRUIT OF THIRTY-FIVE YEARS OF EXPERIENCE. AN ABSOLUTELY NEW WAY OF MANUFACTURING ICE. A COMBINATION OF THE COMPRESSION AND ABSORPTION AMMONIA SYSTEMS.

D. L. HOLDEN, 1336 Beach St., PHILADELPHIA, PA.

SOLE MANUFACTURER OF THE **REGEALED ICE MACHINE**

SMALL MACHINES, ONE TO TWO TON CAPACITY



ESTABLISHED 1853.
INCORPORATED 1885.
CAPITAL, $1,000,000.

S. B. RINEHART, President.
A. H. STRICKLER, Vice-President.
H. B. STRICKLER, Treasurer.
EZRA FRICK, Gen'l Manager and Sec'y
A. H. HUTCHINSON, Manager Ice and Refrigerating Dep't.

SMALL MACHINE DIRECT CONNECTED ELECTRIC MOTOR.

FRICK COMPANY

...WE... BUILD

ICE PLANTS Can or Plate System. Special Machinery for Breweries, Hotels, Creameries, Skating Rinks.

REFRIGERATING PLANTS —Direct or Brine System. For Cold Storage and Refrigeration in any of their branches.

CORLISS ENGINES Condensing and Non-condensing. Single Cylinder and Double to Quadruple Compound. Forty to 3,000 H. P. For all manufacturing purposes.

AMMONIA VALVES, FLANGES and FITTINGS of our improved design and best material, same as those supplied with our regular standard plants.

STEAM BOILER PLANTS and TANK WORK —Locomotive, Upright and Return Tubular Boilers. Special Tanks for all uses.

OUR FACILITIES for designing and manufacturing enables us to fill your order satisfactorily.

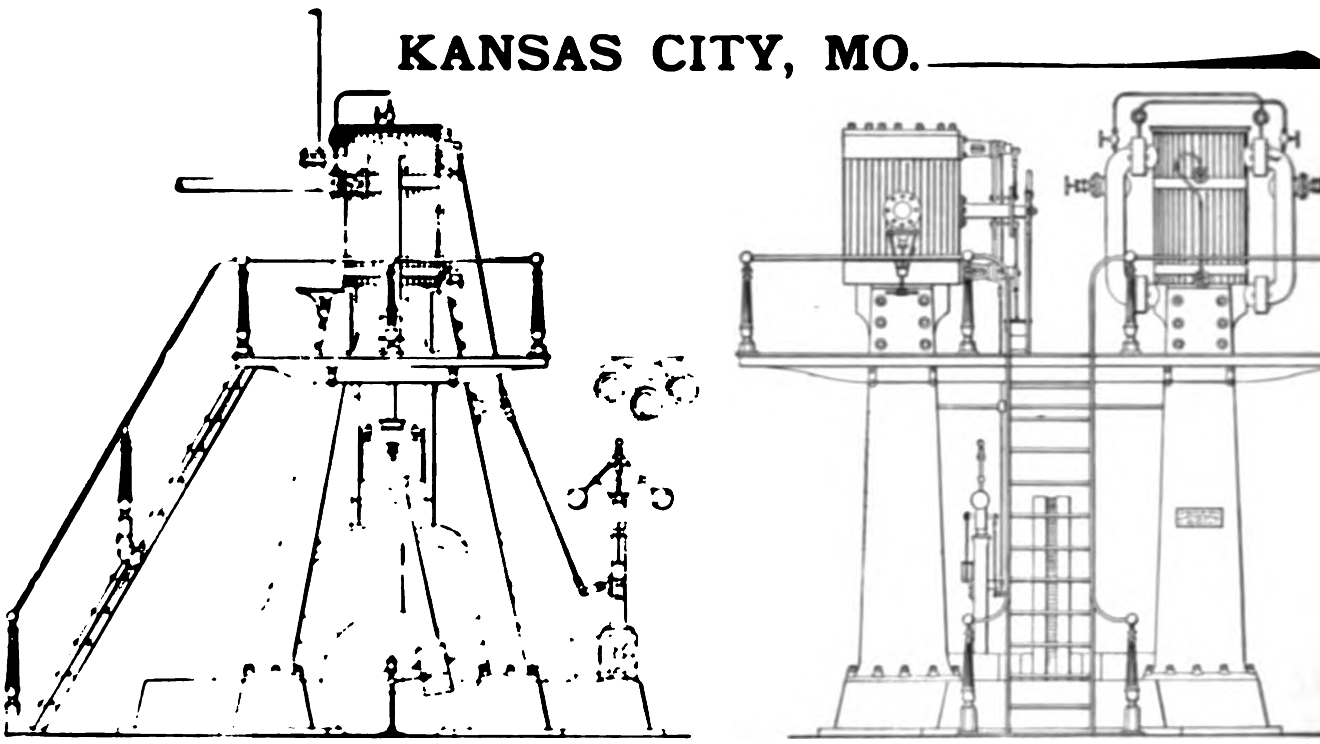
ICE MAKING AND R

ICE DUMPING APPARATUS.

Engineers

THE RIVERSIDE IRON WORKS CO.

KANSAS CITY, MO.



100-TON REFRIGERATION MACHINE SECTIONAL FRONT AND SIDE VIEWS.

MANUFACTURERS OF

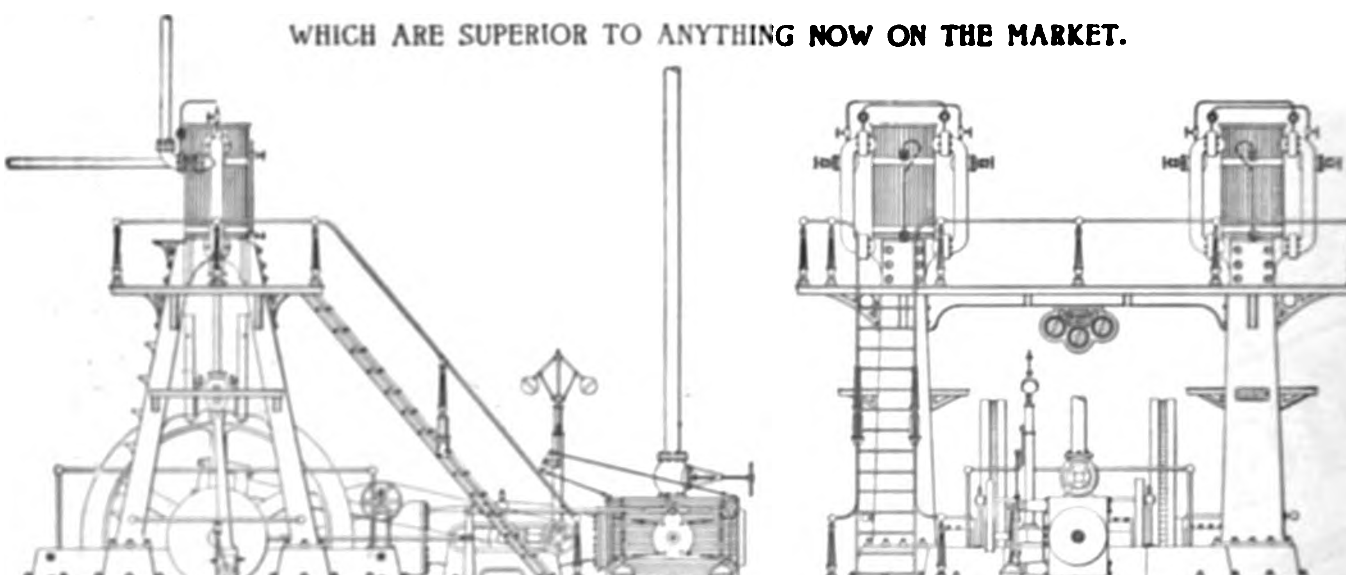
ICE AND REFRIGERATING MACHINERY

OF ANY SIZE OR CAPACITY, ON THE COMPRESSION PRINCIPLE

ALSO MANUFACTURERS OF

SPECIAL AMMONIA FITTINGS

WHICH ARE SUPERIOR TO ANYTHING NOW ON THE MARKET.



200-TON REFRIGERATION MACHINE—SECTIONAL FRONT AND SIDE VIEWS.

We contract for the EQUIPMENT OF COMPLETE PLANTS, either for Ice Making, Cold Storage, or Packing Houses or Breweries.

PARTIAL LIST OF MACHINES IN OPERATION:

St. L[illegible] Storage [illegible] St. L[illegible] Mo.	1 [illegible] Ref	Ja[illegible] Packing Co., Buffalo, N. Y.	2 [illegible] Ref
[illegible] Storage [illegible] Kansas City	1 [illegible]	Ja[illegible] Packing Co., Kansas City, M[illegible]	1 [illegible]
[illegible] Packing Co., Kansas City, Kan.	2 [illegible]	[illegible] Ice Co., Fort Smith, Ark.	1 [illegible]
[illegible] Omaha, Neb.	1 [illegible]	[illegible] Kansas City, Mo.	1 [illegible]
Kansas [illegible] Storage Co., Kansas City, Mo.	1 [illegible]	[illegible] Topeka, Kan.	1 [illegible]
[illegible] Storage Co. [illegible]	1 [illegible]	[illegible] Storage Co., [illegible], Kan.	1 [illegible]
Kansas City [illegible] Storage Co., Kansas City, Mo.	1 [illegible]	Coates House, Kansas City, Mo.	1 [illegible]
Ryan & Richardson, Leavenworth, Kan.	1 [illegible]		

CORRESPONDENCE SOLICITED. P. O. ADDRESS, STATION A.

"BOYLE"

RUEMMELI & SIEBERT

Refrigerating Machine Company

THE BALL MACHINE

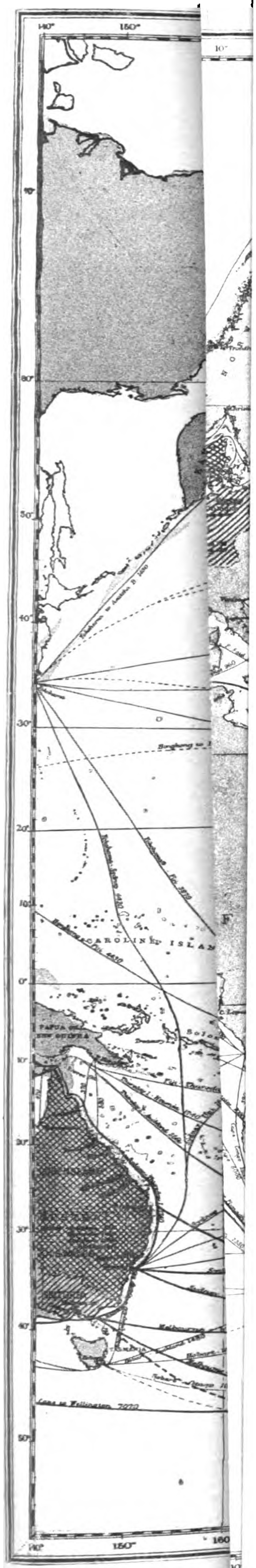
Was Installed during 1899 in the Following Plants:

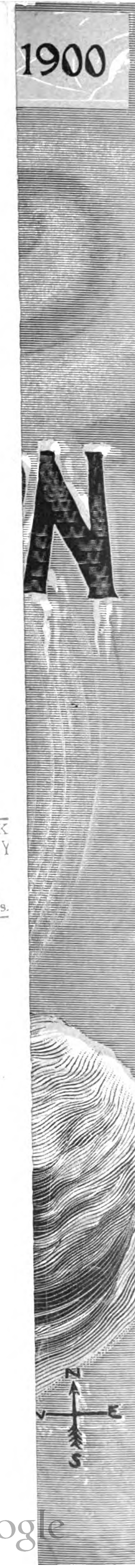
Swift & Company,	One Machine Compound Condensing Engine,	500 tons.
Hammond Packing Company,	Two Machines Compound Condensing Engines,	500 tons.
Nelson Morris & Company,	One Machine Non-Condensing Engine,	250 tons.
Mound City Ice & Cold Stor. Co.,	Two Machines Compound Condensing Engines,	500 tons.
Columbia Brewing Company,	One Machine Non-Condensing Engine,	250 tons.
Capitol Brewery Company,	One Machine Non-Condensing Engine,	75 tons.
Union Brewing Company,	One Machine Non-Condensing Engine,	50 tons.
Poplar Bluff Ice Company,	One Machine Non-Condensing Engine,	50 tons.
Malden Ice Mfg. Company	One Machine Non-Condensing Engine,	25 tons.
Citizens Ice Company,	One Machine, Absorption,	50 tons.
Wm. E. Ralph,	One Machine, Absorption,	50 tons.
Peoria Ice Company,	Generator-Condensers, etc., Absorption,	100 tons.
Vigo Ice Company,	Generator, etc., Absorption,	100 tons.
Hammond Packing Company,	2-inch Direct Ammonia Piping.	150,000 feet.
St. Louis Dressed Beef and Provision Company,	2-inch Direct Ammonia Piping,	50,000 feet.

THE above 500-ton machine, installed for Swift & Company, the largest packers in the world, is the fourth machine of this size and tenth order furnished them . . . It is therefore unnecessary to speak of the durability, economy, efficiency and general success of this machine . . .

ICE & COLD MACHINE COMPANY

ST. LOUIS, MO.

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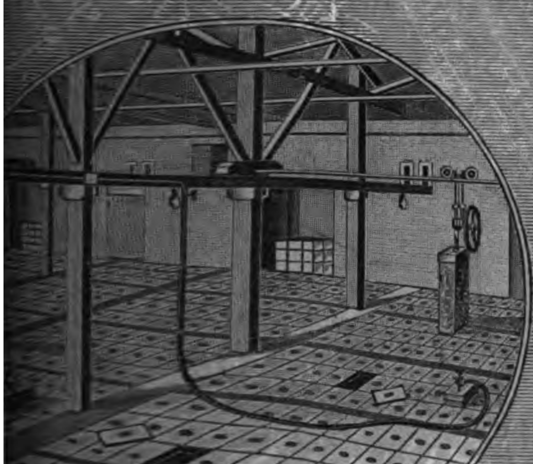
Vol. 18 ∴ No. 2

February, 1900

Ice and Refrigeration

Illustrated



H. S. Rich & Co.
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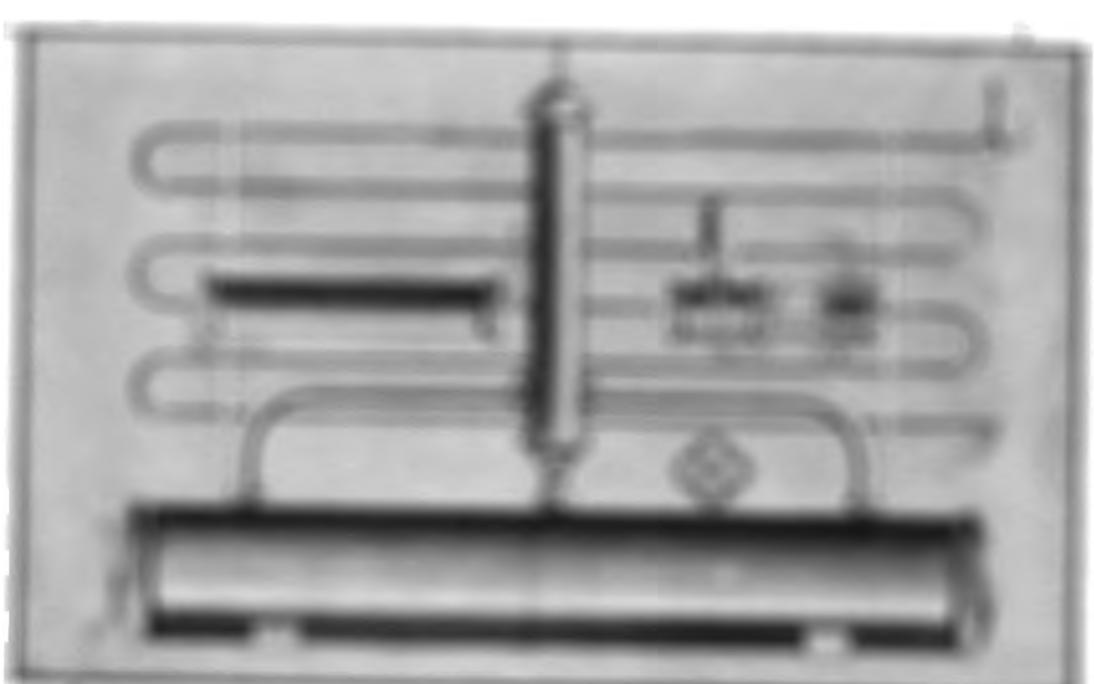



Insulating Board

NONPAREIL CORK

ICE AND REFRIGERATION ILLUSTRATED
A Monthly Review of the Ice, Ice Making, Refrigerating, Cold Storage and Kindred Trades.

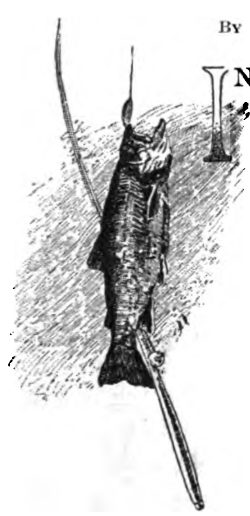
VOL. XVIII. No. 2. CHICAGO : NEW YORK : FEBRUARY, 1900. $2.00 PER ANNUM.

[*Written for* ICE AND REFRIGERATION.]

FREEZING AND STORING FISH.

IMPORTANCE AND GROWTH OF THE INDUSTRY—ENOCH PIPERS' SYSTEM—DAVIS' SYSTEM—ICE AND SALT FREEZERS—FREEZING BY MECHANICAL REFRIGERATION.

BY CHARLES H. STEVENSON.



IN the artificial freezing of fish and their subsequent retention in cold storage is found one of the most recent methods of food preservations, originating about thirty-five years ago, and while it has acquired considerable importance in certain localities, its practical value is scarcely appreciated by the general public. It is applied in the various marketing centers of the United States, and to some extent in the countries of Europe and South America. Its greatest development and most extensive application exists along the great lakes, in freezing whitefish, trout, herring, pike, etc., about 7,000,000 pounds of which are frozen each year. On the Atlantic coast of the United States it is used in preserving bluefish, squeteague, mackerel, smelt, sturgeon, herring, etc., the trade in these "tailing on" or immediately following the season for fresh or green fish. On the Pacific coast large quantities of salmon and sturgeon are frozen and held in cold storage until shipped, the trade extending to all parts of America and northern Europe. At various points throughout the interior of the country there are cold storage houses where fishery products are held awaiting demand from the consumers. In Europe there is comparatively little freezing of fish, although the process is applied very extensively to preserving beef, mutton, etc., and the markets of Hamburg and other continental cities receive annually several million pounds of frozen salmon from our Pacific coast. In England large fish freezers were erected several years ago at Grimsby and Hull, and trawlers are in some cases supplied with refrigerating plants where the fish are plunged alive into cold brine which freezes them solid.

During warm weather the temperature of the fish storage room can never be kept below 32° F., by the use of ice alone. While a temperature of 32° F. retards decomposition, the fish acquire a musty taste and loss of flavor, and eventually spoil. To entirely prevent decomposition the fish must be frozen immediately after capture, and then kept at a temperature of several degrees below freezing. The belief held by some persons that freezing destroys the flavor of fish is not well founded, the result depending more on its condition when the cold is applied and the manner of such application than upon the effect of the low temperature. Fish decreases less in value from freezing than meat does, but it is especially subject to two difficulties from which frozen meat is free; first, the eye dries up and loses its shining appearance after considerable exposure to cold, and second, the skin, being less elastic than the texture of the fish, becomes hard and somewhat loose on the flesh. Frozen fish is not less wholesome than fish not so preserved. The chemical constituents are identical, except that the latter may contains more water, but the water derived from injested fish has no greater food value than water taken as such. The principal objection to this form of preservation is the tendency to freeze fish in which decomposition has already set in, and the prosperity of the industry requires that any attempt to freeze fish already slightly tainted should be discountenanced. When properly frozen and held for a reasonable period, the natural flavor of fish is not seriously affected and the market value approximates that of fish freshly caught. The process is of very great value to the fishermen supplying the fresh fish trade, since it prevents a glut on the market, and it is also of benefit to the consumer in enabling him to obtain almost any variety of fish in an approximately fresh condition throughout the year.

DEVELOPMENT OF COLD STORAGE.

The first practical device for the freezing and cold storage of fish was invented by Enoch Piper, of Camden, Me., to whom a patent was issued in 1861. His process, based on the well known fact that a composition of ice and salt produces a much lower temperature than ice alone, consisted in placing the fish on a rack in a box or room having double sides filled with non-conducting material, and metallic pans containing ice and salt were set over the fish, and the whole inclosed. The temperature in the room would soon fall to several degrees below the freezing point of water,

and in about twenty-four hours the fish would be thoroughly frozen. The fish were then covered with a coating of ice by immersing them a few times in ice cold water, forming a coating about ⅛-inch in thickness, after which the fish were wrapped in cloth, and a second coating of ice applied. In some instances they were covered with a material somewhat like gutta percha, concerning which much secrecy was exercised. The fish were then packed closely in another room well insulated against the entrance of warmth, and in which were a number of perpendicular metallic tubes, several inches in diameter, filled with a mixture of ice and salt to keep the temperature below the freezing point.

The process was also patented in the Dominion of Canada, and a plant was established at Bathurst, New Brunswick, in 1865, the output consisting almost entirely of salmon, a large proportion of which were imported into the United States. In order to hold the frozen fish in New York, while awaiting a market, Piper constructed a storage room in a shop on Beekman street, that being the first cold storage room for fish in the United States. The walls of the room were well insulated, and around the sides were two rows of zinc cylinders, ten inches in diameter at the top, and decreasing in size toward the bottom, connecting at the lower end with a drainage pipe. The cylinders were filled with a mixture of ice and salt, which was renewed whenever necessary. Whatever may have been the imperfections in his process of freezing, the system of storage was quite satisfactory, and differs little from that in use at the present time. Piper refused to sell rights to others for the use of his process, and after maintaining a monopoly of the business for three or four years his exclusive right to it was successfully contested by other fish dealers in New York, who applied it to storing other fish besides salmon.

The principal objection to Piper's process is that the fish are not in contact with the freezing mixture during the operation of freezing, and, consequently, too much time is required for them to become thoroughly frozen. Several devices have been used for overcoming this objection, among which are covering the fish with thin sheet rubber or other waterproof material, and packing them in the mixture of ice and salt.

The greatest improvement, and the one used almost exclusively when ice and salt form the freezing agency, originated in 1868 with Mr. William Davis, of Detroit, Mich., the description being as follows: Two thin sheet metal pans are made to slide one over the other, the object being to place the fish in one pan, slide the other pan vertically over it, and the box is then placed in direct contact with the freezing mixture. By having the box constructed in this manner, it is capable of being expanded or contracted to accommodate the size of whatever may be placed therein, and the top and bottom always be in contact with the articles to be frozen. After the fish are inclosed in the pans, the latter are placed in alternate layers with layers of the freezing mixture between and about them. When the fish are thoroughly frozen they are removed from the freezing pans and placed in a cold storage chamber at 10° or 12° below freezing.

As the trade developed the size of the storage rooms increased and improvements were adopted in the arrangement and form of the ice and salt receptacles, and in the method of handling the fish. But the freezing with pans immersed in ice and salt, as in the Davis process, and the subsequent storage in the manner used by Piper, continued without great modification until the introduction of mechanical refrigeration into the fishing trade in 1892. At that time ice and salt freezers and storage rooms existed at nearly all the fishing ports on the great lakes; eight or ten small ones were in New York city, and several were in use on the New England coast. Some of those on the great lakes were quite large, with storage capacity of 700 or 800 tons or more, and the aggregate capacity of all in the country approximated 8,000 tons. Cold storage houses fitted with ammonia machines had been established at various places along the coast and in the interior during the ten or fifteen years preceding, and in these some frozen fish had been stored. But the first establishment using a refrigerating machine for freezing fish exclusively was erected at Sandusky, Ohio, in 1892. The method of freezing in these establishments differs from the ice and salt process in that the pans of fish are placed on and between tiers of pipes carrying cold brine or ammonia instead of being immersed in ice and salt. In the storage rooms less difference exists, coils of brine carrying pipes taking the place of the ice and salt receptacles, the blocks of fish being removed from the pans and stored as in the older process.

DESCRIPTION OF ICE AND SALT FREEZERS.

The output of an ice and salt freezer consists principally of temporary stalls or bins where the fish are frozen, and insulating rooms where the frozen fish are stored at a low temperature. In addition to these there are ice houses, salt bins, freezing pans, and the various implements for the convenient prosecution of the business. The freezing bins are usually temporary structures within the fish house, and are generally without insulation. The walls of the fish house may form the back, while loose boards are fitted in to form the sides and front as the bin is filled, in the manner hereafter described. A better way is to construct the bin with permanent sides and back four or five inches thick, fitted with some non-conductor, with double or matched floor, and with movable front boards.

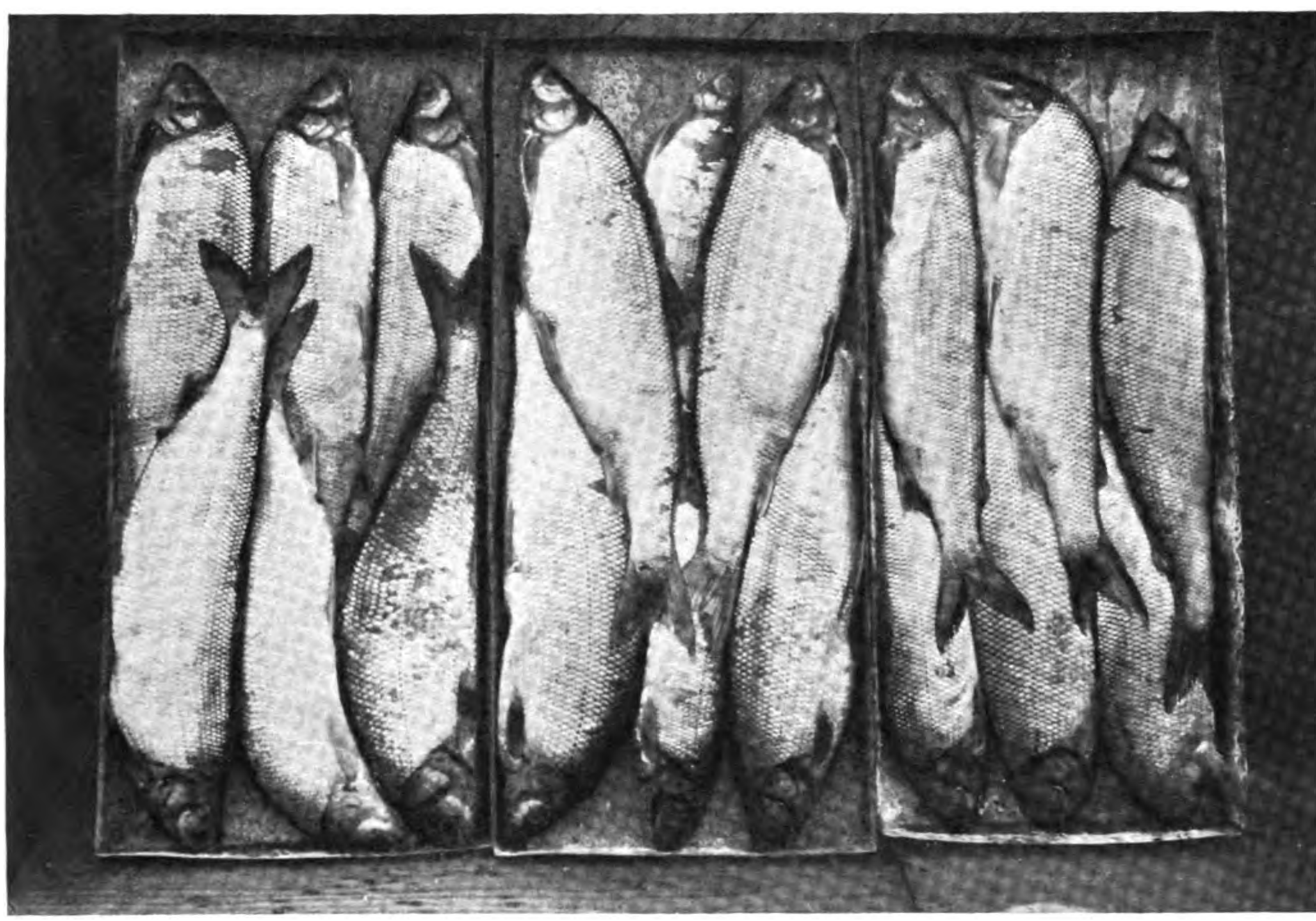
The storage rooms are commonly arranged in a series side by side and separated from each other by well insulated partitions, the capacity of the rooms ranging from twenty-five to 250 tons each. The outer walls of these rooms, as well as the floors and ceilings, are well insulated, made usually of heavy matched boards, with interior packing of some non-conductor of heat, such as planing mill shavings, sawdust, pulverized charcoal, chopped straw, rock wool, slag wool, etc. Most of the walls are sixteen or eighteen inches thick, filled with planing mill shavings or sawdust, and in some freezers the damaging effect of rats is obviated by placing linings of cement between the shavings and the board walls. Most of these loose materials have their economic drawbacks, chiefly because of their strong hygroscopic tendency, the material losing its insulating power and decaying, this decay also

attacking the wood of the walls. Because of this, many of the storage rooms recently constructed are insulated by having the walls made up of a combination of rock or mineral wool, insulating paper, air spaces and inch boards.

The sides, and in some cases the ends of the room, are lined with the ice and salt receivers, consisting of galvanized sheet iron tanks, eight or ten inches wide at the top, narrowing to three or four inches at the bottom, and placed about four inches from the wall in order to expose their entire surface to the air in the room. These tanks open at the top, which extends above the ceiling, so that they may be filled without opening the storage rooms. At the bottom is usually a galvanized iron gutter, into which the water resulting from the melting ice flows, whence it is conducted through the floor of the room by a short pipe, protected from the entrance of air at its lower end by a small drip cup, into which the brine falls and runs over at the top. The ice and salt tanks must be cleaned from time to time in order to rid them of dirt and sawdust. Their capacity should be in proportion to the size of the room and the excellence of the insulation, and they should be large enough to render it unnecessary to fill them oftener than once a day, even in the warmest weather.

FREEZING BY MECHANICAL REFRIGERATION.

In the freezing houses using mechanical refrigeration there is, as customary with cold storage houses used for other products, a machinery room containing the boilers, compression pump or absorption tank, according to the system employed, brine pump, etc. Apart from these, and within well insulated walls, are the cold rooms, of which there are two kinds, one for the freezing of fish and the other for their storage after being frozen, the capacity of the latter being usually much greater than that of the former. In the freezing room the circulating pipes containing the cooling material are one-half inch to two inches in diameter, and arranged in shelves or nests with horizontal layers four or five inches, and sometimes ten inches apart, ranging from the floor to the ceiling, the entire room being occupied with these nests, except sufficient space for moving about. The temperature depends, of course, on the quantity of green fish and the progress of the freezing process; but with direct expansion, or using brine made of chloride of calcium as the circulating medium, a temperature of—10° F., or less, is obtainable. In this room the fish are frozen, and then they are removed to the storage rooms. These are constructed similarly to the storage rooms in ice and salt freezing houses, the only difference being that brine carrying pipes are substituted for the ice and salt receptacles. The pipes in the storage rooms are usually larger, but are not so numerous as in the freezing room. They are arranged at the ceiling, and sometimes about the upper side walls also.



PANS OF FROZEN WHITEFISH, SHOWING ARRANGEMENT OF FISH IN THE PANS.

In freezing fish, as in preserving most food products, close attention must be given to the economy of the process as well as to the excellence of the product, and the expense of the best process frequently prevents its use. To secure the best results, the stock to be frozen should be perfectly fresh and free from bruises and blood marks. It improves the appearance, and therefore increases the value, if the fish are

graded according to size, but this is rarely done. All kinds of fish keep and look best when frozen just as they came from the water, with heads on and entrails in, and it is better that the fish be not eviscerated before freezing, except in case of very large fish, such as sturgeon. But since the freezers receive the surplus from the fresh fish trade, many have been already split and dressed. Generally, fish that are frozen with heads off and viscera removed are not strictly fresh, but this rule has several exceptions.

Whether round or eviscerated, the fish are first washed by dumping them into a wash box or trough containing fresh cold water, which is frequently renewed, and stirring them about with an oar shaped paddle or cloth swab, to remove the slime, blood, etc. Some freezers consider it inadvisable to wash flat fish, because of their being too thin. From the wash box the fish are removed by hand and placed in the pans in such a manner as to make a neat and compact package entirely filling the pan, so that the cover will come in contact with the upper surface of the fish. It is desirable, when the size of the fish so admits, that the bellies be placed upward, since that portion has greater tendency to decompose, and, as the cold passes down, this arrangement results in freezing the upper portion of the block first, and also in less compression of the soft portion of the fish by removing the weight therefrom. It is also desirable to have the backs of the fish at the sides of the pan and the heads at the ends, so as to protect the blocks in handling, but this is by no means a uniform practice. In case the fish have been split and eviscerated it is desirable to place them slanting on the sides, but with backs up, so as to permit the moisture to run from the stomach cavity. Some freezers place herring and other small fish on their sides, two layers deep in the pans, while others place a bottom layer of three transverse rows, the end rows with the heads to the edge of the pan, and a top layer of two transverse rows laid in the two depressions formed between the bottom rows. In case of pike and some other dry fish a small quantity of water is sprinkled over them, since they do not ordinarily retain sufficient moisture to hold together when frozen, as the case with most species. As soon as the pans have been filled and the covers fitted on they are placed in the sharp freezers, which have been described.

In those houses using ice and salt as the freezing medium the arrangement of the ice, salt and fish pans is as follows: The ice, after being passed through a grinder, where it is crushed into small particles; is mixed with salt in the proportion of from eight to sixteen pounds of salt to one hundred pounds of ice. The mixing is most conveniently done by scattering salt over each shovelful of ice as the ice is shoveled from the grinder to a wheelbarrow. Many varieties of salt are used, most houses preferring a coarse mined salt because of its cheapness. Others use finer salt because it comes into closer contact with the ice and results in a lower degree of cold and the more rapid freezing of the fish, although the mixture does not last as long.

The amount of ice and salt required in freezing a given quantity of fish depends principally on the fineness of the materials and the proportions in which they are used, and to a less extent on the outside temperature, the amount of moisture in the atmosphere, the size of the pans and the manner in which the fish are placed therein. The finer the ice and salt, the quicker the freezing and the consumption of the ice. A larger proportion of salt results also in quicker freezing. The most economical quantities appear to be about eighty-five pounds of salt and 1,000 pounds of ice to each 1,000 pounds of fish, although some freezers use much more salt and less ice. Much larger quantities of ice and salt are required during warm weather, and also more is necessary when the atmosphere is moist than when it is dry. Some of the ice and salt generally remains unmelted, and this may be used over again in connection with fresh materials, additional salt being mixed with it; and as it is weaker than new ice it should be used mainly at or near the bottom, the top of the pile taking care of the bottom, since the cold descends.

In making the freezing pile, an even layer of ice and salt, about three or four inches deep, is placed at the bottom, on which is laid a tier or layer of pans filled with fish, about three inches of ice space intervening between the pans and the sides of the bin. This is followed successively by a layer of ice and salt about two or three inches deep, and a layer of pans, the surface of each layer of ice being made even and smooth by means of a straight edge. Sideboards are placed as the height of the pile requires, and a wide board laid on the pile furnishes a walk for the workmen in placing the freezing mixture and the pans. Some freezers place the pans in double tiers between the layers of ice and salt, and in this case the thickness of the layers of freezing material must be increased. In some freezers a light sprinkling of salt is thrown on top of the pans as they are successively placed. The pile is built up as high as it is convenient for handling the pans of fish, which usually does not exceed six feet. A double quantity of the freezing material is put on top, and the whole should be covered with wood or canvas to exclude the air. The fish are usually frozen completely in about fifteen or eighteen hours, but they usually remain in the pile until the following morning, when they are ready to be placed in cold storage.

METHOD OF STORING THE FROZEN FISH.

Being moist, the fish are frozen solidly to each other and to the surfaces of the pans while in the sharp freezer. To remove them from the pan the latter is usually passed for a moment through cold water, which draws the frost sufficiently from the iron to allow the fish to be removed in a block without breaking apart. In one or two freezing houses the thawing of the fish from the sides of the pan is omitted, the cover being loosened and the block of fish removed by striking the pan at the ends and sides, after which the block of fish is dipped for a moment in cold water.

Considerable moisture adheres to the fish from its being dipped in water, and this being frozen by the surplus cold forms a coat of ice about one-fiftieth inch thick, entirely surrounding the irregular block. The process of freezing dries the fish to some extent, the loss in weight amounting to about 2 per cent, but the ice coating adds about 4 per cent to the weight.

After the coating of ice has been applied, the fish are passed to the cold storage room, where they are arranged in neat piles, the blocks being placed vertically in some instances; but more frequently they are arranged horizontally in piles extending from the floor nearly to the ceiling. Strips two or three inches thick are laid on the floor to keep the fish slightly elevated, and allow the cold air to circulate underneath.

The quantity of ice and salt required in the establishments which use those materials in the storage rooms is dependent on the outside temperature and the excellence of the wall insulation, and is independent of the amount of frozen fish in the room, requiring no more freezing material to keep fifty tons of frozen fish at an even temperature than to keep two tons in a room of equal size. With 16-inch or 18-inch walls, well insulated, it requires the melting of about forty pounds of ice per day for each 100 square feet of wall surface when the outside temperature is 60° F., to maintain a temperature of 18° F. inside, this calculation leaving the opening of doors and the cooling of fresh material out of consideration. The temperature in the storage room should be constant, and about 16° or 18° F. is considered the most economical. Above 20° the fish are likely to turn yellow about the livers, a result generally attributed to the bursting of the "gall."

The storage rooms should be free from moisture, since the latter offers a favorable place for the settlement and development of micro-organisms of all kinds, which tend to mold the fish. To reduce excessive moisture, a pan of unslaked lime, chloride of calcium or other hygroscopic agency, may be placed in the room, the material being renewed as exhausted. If the storage rooms are very moist, they should be dried out before storing fish in them, this being readily accomplished by using a small gas, coke or charcoal stove. The storage rooms cooled by refrigerating machines may be dried by passing hot water through the pipes, which, of course, should, under no circumstances be done when there are fish in the rooms. In case of mold appearing on the fish, it might be well to try spraying them with a solution of formalin, consisting of ten parts of formalin and ninety parts of water, which should be used at the first sign of mold.

DETERIORATION OF FISH AFTER FREEZING.

All fish deteriorate to some extent in cold storage, depreciating both in flavor and firmness. The amount of this decrease is dependent primarily on the condition of the fish before freezing and the care exercised in the process of freezing, and, secondarily, on the length of time they remain in cold storage. The loss in quality during storage is due principally to evaporation, which begins as soon as the fish are placed in storage, and increases as the ice coating is sapped from the surface.

Evaporation proceeds at very low temperatures, though not so rapidly as at higher ones; even at a temperature of 0°F. the evaporation during two or three months is considerable. The heavier the ice coating the less the evaporation; but it is almost impracticable to entirely prevent it, and under ordinary conditions it amounts to about 5 per cent in weight in six months, but the loss in quality is greater than the loss in weight.

The most practicable method of restricting evaporation, other than coating with ice, is to wrap the fish in waxed or parchment paper and place them in shipping boxes, whose length and width are slightly greater than the blocks and deep enough to contain four or five blocks, or 120 to 150 pounds of fish.

Along the great lakes the most popular fish for cold storage are whitefish, lake trout, lake herring, blue pike, saugers, sturgeon, perch, wall eyed pike, grass pike, black bass, codfish and eels. In addition to these species, the great lakes freezers receive large quantities of blue fish and squeteague (sea trout) from the Atlantic. On the Atlantic coast bluefish, halibut, squeteague, sturgeon, mackerel, flat fish, cod, haddock, Spanish mackerel, striped bass, black bass, perch, eels, carp and pompano are frozen. Salmon, sturgeon and halibut are the principal species frozen on the Pacific coast.

Some varieties of fish are so very delicate that it is not deemed profitable to freeze them, especially shad, but even these are frozen in small quantities. Oysters and clams should never be frozen, the best temperature for cold storage being 35° or 40° F., and when stored in good condition they will keep about six weeks. As an experiment they have been kept twelve weeks, but storage for that length of time is not advisable. Caviar also should never be frozen, but held at about 40°. Scallops and frogs' legs, however, are frozen hard in tin buckets and stored at a temperature of 16° to 18° F. Sturgeon and other fish too large for the pans are frequently hung up in the storage rooms by large meat hooks, and when frozen are dipped in cold water and stored in piles.

In some of the largest freezing houses on the Atlantic seaboard, which freeze and store fish as well as other food products, the fish to be frozen are simply hung up in the sharp freezer, the heads being forced on to the sharp ends of wire nails protruding from cross-laths arranged in series. After the fish are frozen they are removed and piled in storage rooms, where the temperature is about 15° or 18° F. When the handling of fish is of minor importance compared with other food products, they are generally placed on slat-work shelves in either a special freezing room or in a storage room where the temperature is kept below 20°, or they are retained in bulk in baskets, boxes or barrels in the same room. But these methods are not productive of results even approximating those in the great lakes freezers.

The cost of cold storage and the deterioration in quality make it inadvisable to carry frozen fish more than nine or ten months, but sometimes the exigencies of trade result in carrying them two and even three years. In the latter case they are scarcely suitable for the fresh fish trade unless the very best of care has been exercised in the freezing and storage, and it is usually better to salt or smoke them.

The rate of charges in those houses which make a business of freezing and storage for the general trade is usually from a half cent to one cent for freezing and storage during the first month, and about half of that rate for storage during each subsequent month, depending on the quantity of fish. However, the cost of running a first-class plant at its full capacity is probably less than one-third, or even one-fourth, of the minimum above quoted, since it costs no more to run a storage room full of fish than one-fifth full.

[*Translated for* ICE AND REFRIGERATION.]

BREWERY REFRIGERATION.

REFRIGERATING PLANT IN R. LEICHT'S BREWERY AT VAIHINGEN A. F., GERMANY—A MODEL PLANT—GAIN BY REFRIGERATION—ILLUSTRATIONS.

BY E. BRUECKNER, MUNICH.

THE brewery, which among those known to me I consider primarily adapted to illustrate a model and modern brewery, is not the "largest brewery," but is about seventh in rank among the great breweries of Germany. Nevertheless the Brewery Leicht, in Vaihingen, is generally considered one of the best equipped breweries in the land, which has always taken advantage of the latest and most advanced improvements—facts which are known to brewing experts far beyond the limits of the German empire. For this reason I may well feel justified in pronouncing it the "best," rather than the greatest brewing plant. I may not be able, however, to fully verify this view by the present short description, but I hope to succeed, at least, in leaving the impression that it is a unique, model plant, the individual and component parts of which work thoroughly in harmony, with the precision of clock work—an impression which, in order to become conviction should, however, be fortified with a visit to the brewery. This should not be neglected by any one having an opportunity to do so, for under the guidance of the proprietor, Mr. Leicht, or of the technical superintendent, Mr. Eckert, they will receive such full and conclusive information about the working details, as cannot be expected to be all embodied in a short article like this. The owner of this brewery and his assistants do not believe in business secrets, and all, even their very dearly bought experiences, are openly placed before every one legitimately interested therein—a liberality not always met with among the fraternity. As an introduction to the detailed description of the refrigerating plant of the brewery a preliminary survey of the general appointments of the brewery seems to be advisable. In this respect we have already been reminded by the exterior appearance of the plant, that we have before us what may be called a manufacturing establishment in the most modern sense of the word: High, capacious buildings, grouped closely together, smokeless chimneys, cars running on wire ropes in all directions and from far away, the giant condenser and the engine house, etc., all indicate extensive and well directed works. The impression of a peculiar and suggestive arrangement is still further fortified when a glance is taken at the interior of the works, which appears almost deserted by human beings; and it becomes very evident indeed that the proprietor has made a marked progress in the consummation of his desire to replace manual work by machinery. The security, independence and economical working which are thus gained for the operation of the brewery are doubtless largely responsible for the great commercial success of the establishment. However, the chief factor in this respect, Mr. Leicht himself, mentions the refrigerating plant with especial force, and when speaking of the rapid growth of the brewery (increase of sales from 26,000 hectoliters in 1884 to 250,000 hectoliters in 1899), he never fails to add: "This result I owe to Linde." Such an unsolicited

FIG. 1.—VIEW IN BREW HOUSE—R. LEICHT'S BREWERY, VAIHINGEN, GERMANY.



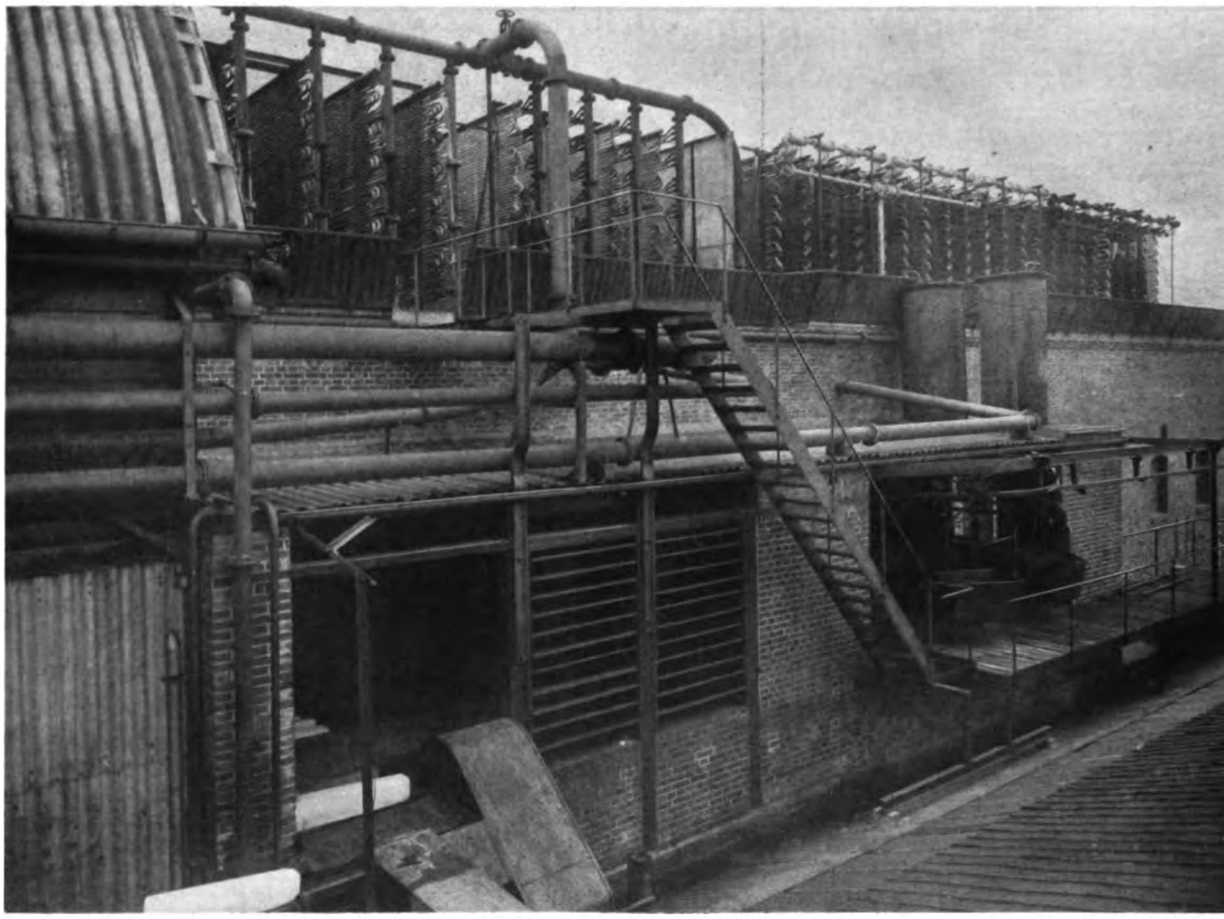



FIG. 6.—VIEW OF CONDENSERS—R. LEICHT'S BREWERY, VAIHINGEN, GERMANY.

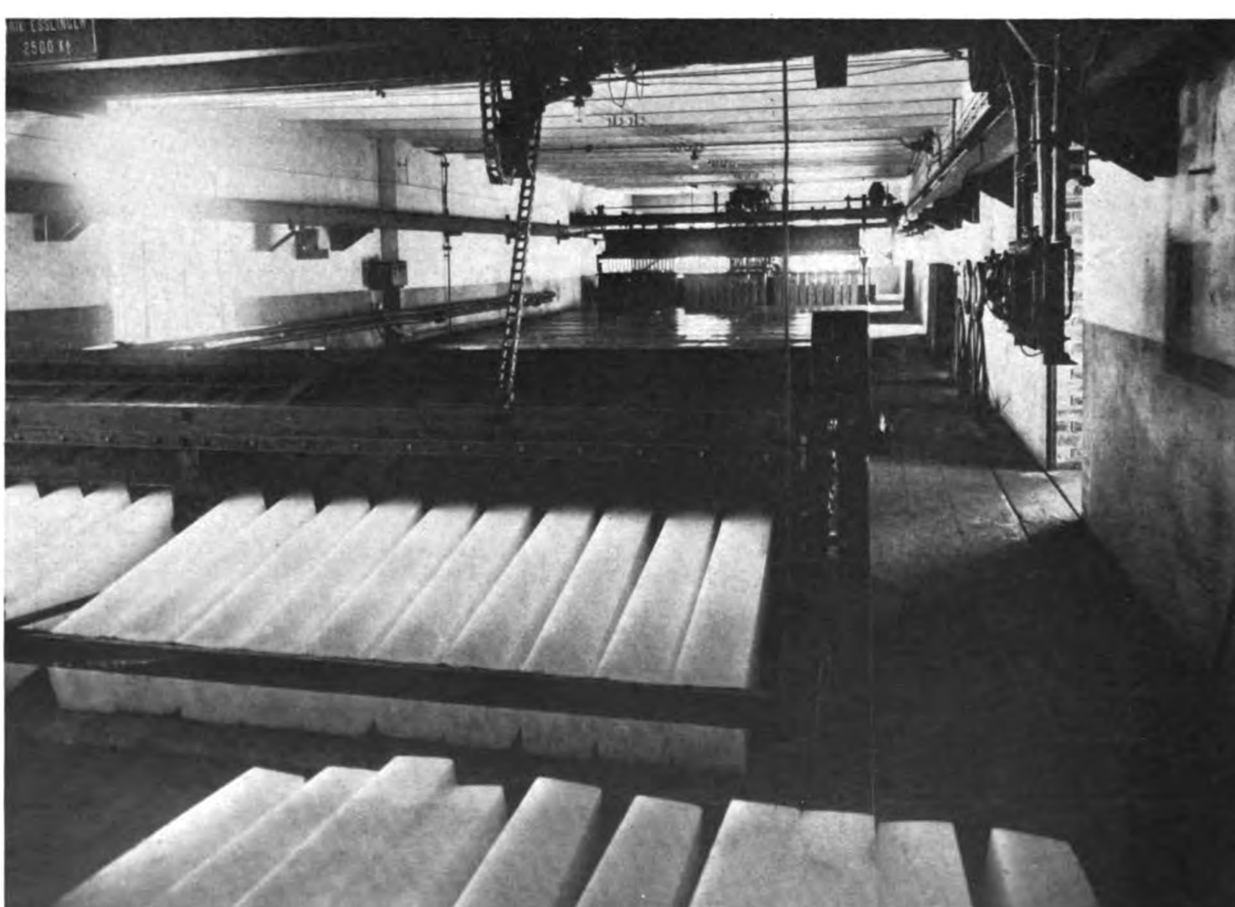


FIG. 7.—ICE FREEZING TANK—R. LEICHT'S BREWERY, VAIHINGEN, GERMANY.

come in contact with the barley. The ready green malt is transported to the kilns automatically, and in the same way the removal from one kiln floor to another is effected,

The brew house proper is unique in size and proportion. The kettles, with their copper helmets, are masterpieces of the coppersmith's art; they are operated by steam and dispose of from three to four brews daily, each of which brew is made from 10,000 pounds of malt. According to careful experiment, about 13,000 pounds of steam are used for mashing and the boiling of wort for each brew of 10,000 pounds of malt. The brew house plant is illustrated in Fig. 1.

The steam making plant, or the interior of the boiler house, is illustrated in Fig. 2, and the same furnishes the steam not only for mashing and boiling of the wort, but also for the power plant which operates the brewery and refrigerating machinery, as well as the dynamos for the production of electric light. The plant comprises three boilers (two with superheaters), each having 140 square meters of heating surface. The pressure of the steam is eight atmospheres. A fourth boiler of the same construction is in process of erection. The coal is brought to the boiler house directly from the coal pile by means of wire rope cars, it is weighed and booked automatically, and coal is stored at least six months ahead to guard against disturbances by strikes, etc. The feeding of each fireplace is also done automatically. The gases of combustion heat the feed water and leave at a temperature of 150° C. In the hottest summer weather, when most coal is needed, the consumption of the article amounts to about 20,000 pounds per day, and each pound of coal evaporates from nine and one-half to ten pounds of water. All boilers are connected with a common conducting pipe which branches off to the old and new engine house and to the brew house proper.

The old engine house, the interior of which is shown in Fig. 3, contains three tandem steam engines, viz.: One tandem engine, installed September, 1895, with condensation, cylinder diameter 370 and 575 mm., stroke 950 mm.; length, 2,800 mm.; fly wheel, 5,400 mm. diameter and 350 mm. width ; indicated horse power, 130, at sixty-two revolutions, connected with ammonia compressor No. 16. One tandem engine, installed February, 1896 ; cylinder diameter, 320 and 525 mm.; stroke, 900 mm.; length, 2,500 mm.; fly wheel, 4,600 mm. diameter and 350 mm. wide ; indicated horse power, 110, with sixty-four revolutions ; this engine is connected with compressor IV. One tandem machine; cylinder diameter, 280 and 450 mm.; stroke, 800 mm.; fly wheel diameter, 4,100 mm. and width 400; indicated horse power, 100, at eighty-four revolutions. This engine is connected with compressor No. 12.

The interior of the new machine house is illustrated in Figs. 4 and 5. It contains a tandem engine, cylinder diameter 360 and 600 mm.; stroke, 1,000 mm.; length, 3,200 mm.; fly wheel diameter, 4,700 mm.; width, 350 mm.; indicated horse power, 150, at sixty revolutions; connected with double compressor No. 15.

It may also be mentioned that all engines work always with condensation, and the heat of the waste steam and even that of the water of condensers is so completely utilized that of the steam used in the brew house proper 2,000,000 calories are regained daily when in full operation.

The exhaust steam, after having passed the surface condensers which serve as heaters, enters the gigantic condensers, which are illustrated in Fig. 6. The condensation, which is here formed, is carried away, as the attempts to use it again for boiler feeding, after careful purification, were futile, since the boilers were damaged by the deposits of oil, which could not be separated from the condensation, not even by the use of wood pulp filters.

Deserving of mention is the ice generator illustrated in Fig. 7, which may be one of the greatest in existence, considered as an individual apparatus. It has a capacity of 130,000 pounds of ice per day, the latter being turned out in blocks (not transparent) of sixty pounds. For the operation of this ice generator only two workmen are required, since the automatic principle has also been carried out to perfection in this branch of the establishment.—*Zeitschrift fuer die Ges. K. Ind.*

INSULATION FOR FREEZING MIXTURES.

IN a recent number of the *Berichte* Prof. Hempel describes a series of experiments undertaken by him, in order to determine which substance was best suited for isolating freezing mixtures in experimental work in the laboratory. Starting with a temperature of about —75° to —80° C. (—103° to —112° F.) produced by solid carbon dioxide and ether, the rate of rise of temperature with time was measured, and, as a result, eiderdown was found to be the best insulator, wool, carefully dried at 100° C. (212° F.) being nearly as good, and having the advantage of cheapness. Three samples of vacuum tubes, of the pattern invented by Professor Dewar, were also tried, and were found to give very varying results among themselves, and all being much inferior in insulating power to either eiderdown or cotton wool. Thus with eiderdown a rise of 12° C. occurred in eighty-eight minutes, with dry wool a rise of 20° to 24° C. in the same time, while the three vacuum jacketed tubes gave, under the same conditions, rises of 65°, 69° and 39° respectively. The results would seem to show that trustworthy Dewar tubes cannot be bought commercially.

TO COOL MAGAZINES OF BATTLESHIPS.

RECENT reports from Washington, D. C., tell of experiments now being made at the Washington navy yard under plans proposed by Rear Admiral O'Neil for refrigerating magazines of battleships to minimize the danger of explosion through overheating. No success has attended trials of that character conducted abroad, but it is believed that Admiral O'Neil's plan will practically insure a reduction of temperature in magazines. If this is accomplished all ships hereafter built will have the refrigerating process applied to their magazines.

THE exports of ice during the month of November, 1899, reached 1,167 tons, valued at $1,688, as against 1,877 tons, valued at $2,253, for the same period of 1898. For the eleven months ending November 30, 1899, the total exports of ice amounted to 14,344 tons, valued at $30,541, as against 23,545 tons, valued at $41,631, for a like period in 1898.

[*Written for* ICE AND REFRIGERATION.]

CHLORIDE OF CALCIUM IN REFRIGERATION.*

ITS VALUE AS AN ABSORBENT AND PURIFIER FOR COLD STORAGE ROOMS—DEVICES FOR APPLICATION—DIRECTIONS FOR PREPARING AND HANDLING—ILLUSTRATIONS.

By MADISON COOPER.

CHLORIDE of calcium is a substance which is known in chemistry as a deliquescent salt, which term means that it will become liquid by the absorption of moisture from the air. It is obtained as a by-product in the preparation of ammonia from ammonium chloride and lime; in the preparation of potassium chlorate from calcium chlorate and potassium chloride; in the ammonia-soda or Solvay process, and in the manufacture of carbon dioxide or carbonic acid gas. The greater portion of the commercial product comes from the waste bittern from the salt works, and the Solvay process for the manufacture of soda.

The capacity of chloride of calcium for water depends largely on the temperature at which the solution from which it is prepared is evaporated, and to the presence of a greater or less percentage of impurities (chloride of magnesium, chloride of sodium, gypsum, sulphates, etc.), which possess comparatively little or no value as absorbents. Commercial chloride of calcium, as generally prepared, holds about 25 per cent of water, and it will absorb in addition to this, when exposed under average conditions in cold storage rooms, somewhere from one-half to nearly its own weight of water, depending on humidity of the air, temperature, method of applying, etc. It is the most active moisture absorber, or drier—as it is sometimes called—in common use, and because of its low price ($10 to $15 per ton), it has come into general use for many purposes. In general character, common salt (chloride of sodium) and chloride of calcium are similar, both having strong affinity for moisture; but chloride of calcium is much the more energetic of the two. Where, in a moist air, common salt only absorbs moisture enough to become damp, chloride of calcium will take up enough moisture to lose its solid form entirely, uniting with the water vapor of the air to form a solution, the result being chloride of calcium brine.

It is a well known fact that cold storage rooms are purified to a large extent by extracting the water vapor which is held in suspension by the air contained in the rooms. The water vapor contains a greater part of the foul gases, germs of decay, etc., which are given off by the goods, or introduced into the rooms by admitting impure moist air from the outside. The water vapor laden with these impurities is disposed of in mechanically refrigerated cold storage rooms by being frozen on the cooling pipes. Because of the strong affinity of chloride of calcium for moisture, it can be utilized to accomplish the same duty in moisture absorbing and purification which can be accomplished by the refrigerating pipes. It has been in use for years for this purpose; the natural ice cold storage houses having used it largely before the advent of the refrigerating machine. When used in a room cooled by air circulated directly from the ice, it is of very little or no service except during very cold weather, because such a room is held at a constant humidity by the air circulating continually in contact with the moist surface of the melting ice.

The possibilities in the use of chloride of calcium for moisture absorbing are well illustrated in the system of overhead ice cold storage originated by Professor Nyce. In these houses the ice is supported above a water tight metal floor, which forms the ceiling of the storage room. The refrigeration resulting from the melting ice above cools the air of the room by conduction through this metal floor. It will be readily seen that unless some provision were made for taking up the moisture which is given off by the goods the air of a storage room cooled in this way would very quickly get into a bad state, as to moisture, mold and foul air. In Professor Nyce's system the moisture given off by the goods and such as may have found its way in through the opening of doors is wholly disposed of by chloride of calcium. This is placed on the floor, under the goods, or suspended in pans from the ceiling of the room. Two or three houses using this system were known by the writer to be in operation last season, and probably are this season, and meeting with fair success. The system gives equally good results with the Fisher, Stevens, Jackson, Dexter and other systems of overhead ice cold storage, which are now considered obsolete. The success of this system depended on chloride of calcium as its only agent for moisture absorbing and purification, and proves conclusively its value for the purpose, and those who are operating mechanically refrigerated houses can take some ideas from this old system which will assist them through the cold weather of fall and winter, when they are obliged to discontinue the flow of refrigerant through the cooling pipes. When this becomes necessary, the frost on pipes must be promptly cleaned off (which is at times impossible, owing to the stock of stored goods in the room), or the frost will throw off water vapor which is laden with impurities which have before been taken from the air of the room. The result is easy to foresee: The air becomes moist and foul, and goods stored in such an atmosphere deteriorate very rapidly. The remedy for such a state of things is to expose to the air of the storage rooms a large quantity of chloride of calcium; or, what is better still, this condition can be made impossible by preventing the formation of frost on pipes by the application of chloride of calcium by a process invented by the writer, which will be described further on.

The methods of applying chloride of calcium to the work of moisture absorbing are numerous, but the devices illustrated and described here have been found to do well and will fit almost any case that may come up. Fig. 1 is a cheap, simple way of supporting the calcium near the ceiling of room. It is best to support the calcium near the ceiling, as the space is less valuable and the moistest air is to be found there. The pan or trough of galvanized iron, shown in the sketch, should be inclined toward the outlet, so that the liquid calcium will flow off into a receptacle as fast as formed. The pan is usually suspended over the alley-way between goods, so that it may readily be

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refilled as required. These pans may be of any size and shape desired, corresponding to the space which they will occupy, but in placing them in the room plenty of space should be left on the sides for the free access of air. The pan shown in Fig. 2 is an improvement on the first, in that the calcium is supported on a wire screen, several inches above the pan below, allowing a free flow of air around the calcium, exposing a greater surface to the action of the air. The liquid dripping from above covers the pan beneath with a film of brine, and the air in contact with this brine will give up its moisture to some extent, resulting in a more dilute brine and, consequently, greater economy in the consumption of the calcium. In other words, a pound of the calcium used in the device shown in Fig. 2 will absorb more moisture than the same quantity used in the device illustrated

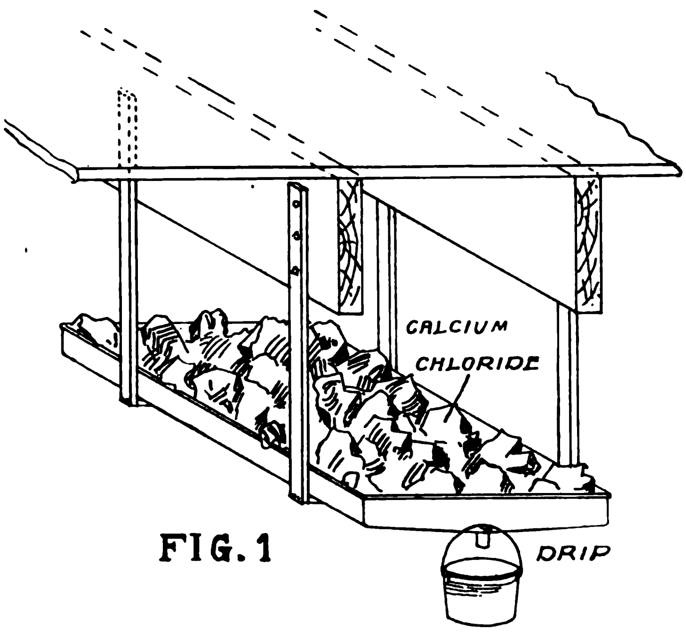


FIG. 1

in Fig. 1. The general explanation of proper method of using, given in connection with Fig. 1, is equally applicable to Fig. 2. These pans should be constructed of galvanized iron throughout, as they are exposed intermittently to the action of the chloride and the dry air outside when they are out of service; and, as the calcium will keep them moist a long time, the action of the air in connection with this moisture will cause them to rust badly. Any iron surface continually covered with calcium brine will rust very little—no more, probably not as much, as it would if exposed to ordinary conditions.

The device shown in Fig. 3 is a more positive and powerful arrangement for drying the air of storage rooms than either of the two described. The chloride is placed in a tank or box on wire screen shelves, as shown, and the air forced or drawn through the box by an exhaust fan, which may be placed on the inlet or outlet end, as may be most convenient. The moist air should be taken from the top of the room to be dried, and conducted to the bottom of box, the dry air to be taken out of the top of box and discharged at the opposite end of the room. In this way the moist air comes first in contact with the liquid calcium, or brine, which lies at the bottom of the box. As the drip from the top shelves drops from one shelf to another, always in contact with the air moving upward, it becomes more and more dilute. It will be seen therefore that the air which is moistest comes first in contact with the dilute brine at bottom of tank, and lastly with the dryest calcium at the top of box. This results in a greater economy in the use of calcium, and gives a more perfect drying effect. With this device, the air of a storage room which is too moist can be dried sufficiently in a day or two. The devices shown in Figs. 1 and 2 are much slower in their action, because depending on the ordinary air circulation in the room to bring the air containing the mixture in contact with the calcium.

A better method than those described, of utilizing chloride of calcium, has been designed and thoroughly tested by the writer. Claims fully covering this process have recently been allowed by the patent office at Washington. In this system the chloride is caused to perform two distinct duties, that of keeping the pipes free of frost during warm weather, and during cold weather, that of maintaining the air of the storage room at its correct degree of humidity, at the same time keeping the air of the storage room in a pure state. The process is applicable to any of the mechanical systems of refrigeration, wherein a refrigerant is circulated through coils of pipe, or to any system where the rooms are cooled by refrigerated metal surfaces.

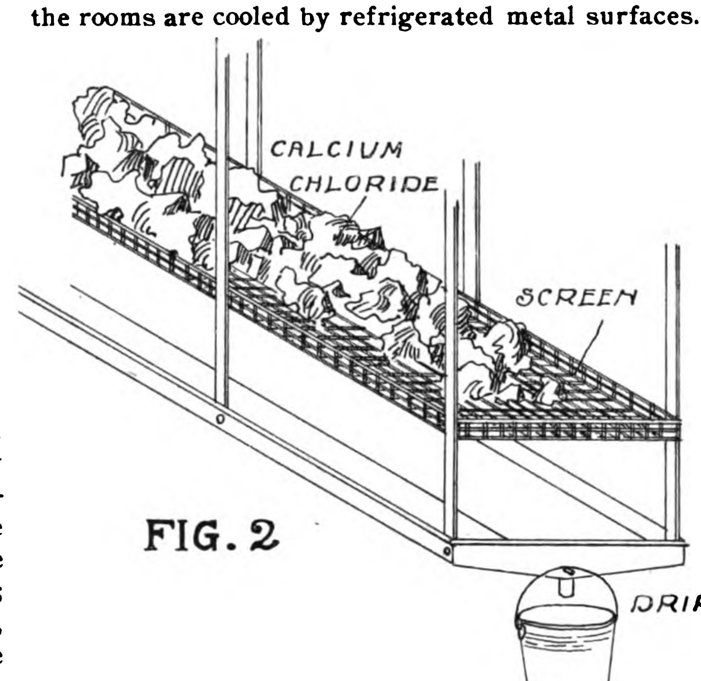


FIG. 2

A much smaller amount of surface is required to do a certain refrigerating duty when the pipes are clean than when the frost is allowed to accumulate on the pipes, and the economy of a device which will keep the refrigerating pipes free of frost at all times will be appreciated by any person familiar with the business, as it is well known that frosted pipes are insulated partly, the degree to which they are insulated depending on the thickness of the coat. I have Mr. E. T. Skinkle's (The Boy) opinion that this is probably about as the square of the thickness of the frost. My process consists simply in placing a quantity of chloride of calcium so that the brine resulting from a union of the moisture in the air with the salt will drip over the refrigerating pipes. After passing down over the pipes, the brine falls onto a water tight floor, which is provided with drip connections to the sewer. This effectually and continually disposes of the brine which contains the moisture and impurities from the

air of the storage room, therefore contamination from this source is impossible. The apparatus illustrated in Fig. 4 is a simple and effective manner of applying the calcium, although it can be applied in any other manner to produce the desired result; as in case of ceiling coils it may be placed directly on the pipe. The film of brine, covering the pipes, which is produced in this way, effectually prevents the formation of frost, and the cooling surfaces of the pipes are therefore maintained at their maximum efficiency at

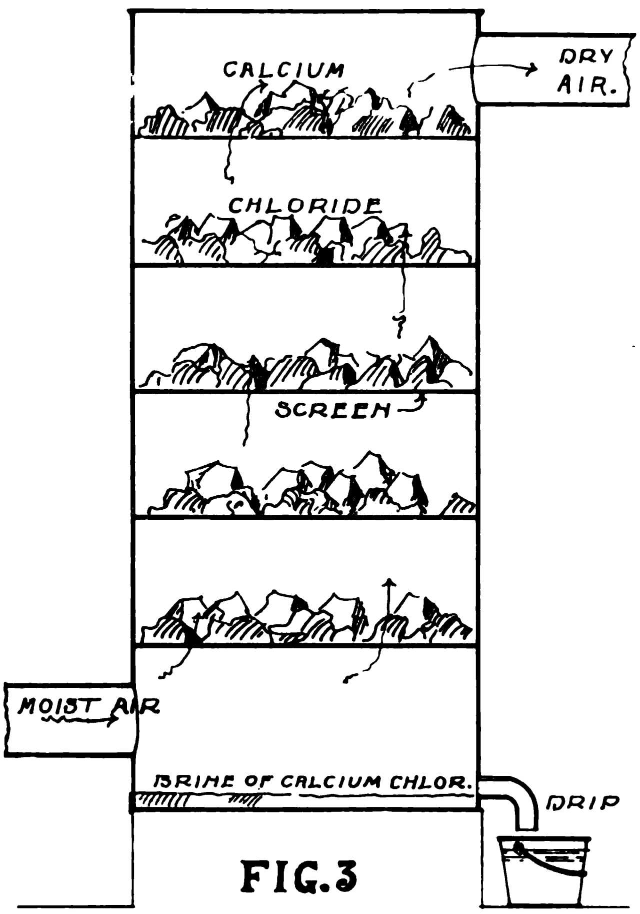


FIG. 3

all times. The economical advantages of this process are great, the cost of installing the apparatus very small, and the cost of calcium for this purpose not large.

The disadvantages of the system are very few, if any. The chief one which has been suggested so far is that the chloride of calcium brine trickling over the pipe surfaces would cause the pipes to rust. Rather than rust the pipes, the brine has a cleaning and protective effect, and coils which have been equipped with this process show freer of rust after being in service for a few weeks than when first fitted up. It is generally conceded by those who have observed carefully that the most favorable condition for rusting of iron is alternately wetting and drying in the presence of a free circulation of air. When the pipes are coated with a film of brine, no corroding action of consequence will take place, because the air cannot have free access to the surface of the pipes.

The expense for chloride of calcium has also been cited as an objection to the process. When it is considered that it is only necessary to supply about the same weight of the salt as of the frost to be kept off the pipes, it will be seen that expense for this salt is of very small importance. The estimated weight of frost which will accumulate on the pipes during the season in a room of 20,000 cubic feet is about 1,000 pounds. The amount will vary greatly with the season of the year, product stored, and whether room is opened often or not, but above figures will cover average conditions. The cost of calcium as compared with the economy which results from maintaining clean pipes at all times is of small moment, amounting to only a very small percentage of the saving effected by maintaining the refrigerating surfaces at their maximum efficiency at all times.

To show the possibilities of this process, combined with the system of forced air circulation designed by the writer, the following is quoted from a letter recently received from a gentleman using these systems. He says:

> A remarkable thing is the small amount of cooling surface required. I put eleven coils, sixteen and one-half feet long, fourteen pipes to the coil, in the coil room, and I am indeed surprised to find that with this system I only need one of these coils, containing 231 feet of 1-inch pipe, brine entering at 14° F. from our ice tank.

This statement refers to the cooling of a room of about 20,000 cubic feet capacity to a temperature of 33° F. This means that a lineal foot of 1-inch pipe is cooling about eighty-five cubic feet of space, with brine at an initial temperature of 14° F.

Naturally, this process, like all others, would have some limitation as to its application; and this limitation is found when a temperature of about 10° F. is reached. It has been used successfully in a room

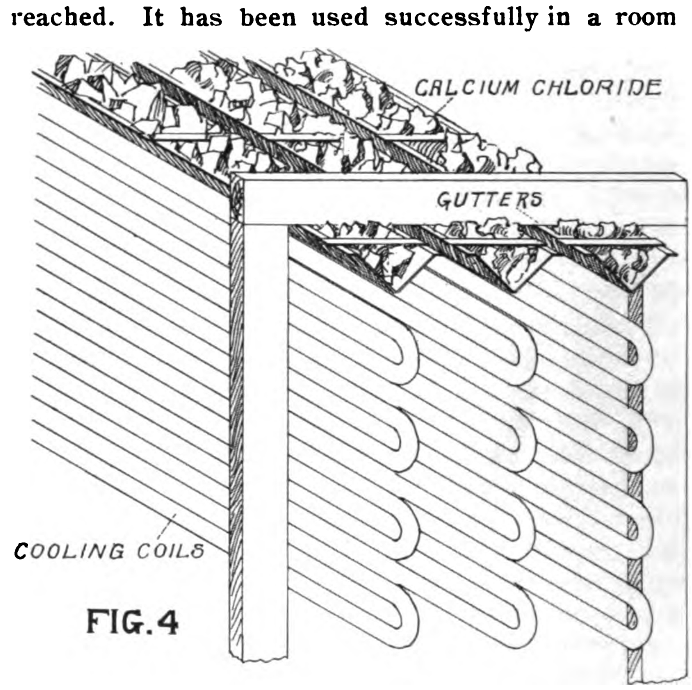


FIG. 4

where the temperature was carried at 18° to 20° F., but when tested in a freezer at a temperature of 8° F. the action of the calcium was very slow and the process inoperative. At a temperature of 30° F. the action is rapid, and no difficulty was experienced in keeping a coil of sixteen 1-inch brine pipes, one above another, free of every trace of frost.

PREPARING AND HANDLING.

The preparation of chloride of calcium for use is attended with some very disagreeable features, unless a person has had experience and knows the nature of the material to be handled. Some of those who have used calcium have been discouraged from using it again by the hard labor required to put it in shape, and the wetting of floors it causes

when carelessly handled. For the benefit of those who have never handled this salt, and for those who have experienced difficulty in its preparation, the following directions are given, which if adhered to, will make the getting ready of calcium as simple a matter as any of the routine work about a cold storage warehouse.

Chloride of calcium in the commercial form comes from the manufacturers in the form of a solid cake, encased in an air tight sheet iron jacket. These jackets are known as drums. They are simply ordinary black sheet iron of a very light gauge, and are of no value, and when removed from the calcium may as well be thrown away at once. The drums of calcium weigh about 600 pounds each, and, though heavy, are easily rolled or trucked, and require very little space for storage.

For use, the calcium needs to be broken into lumps, ranging in size from ten pounds downward. This is for convenience in handling and for the purpose of exposing a fair amount of surface to the action of the air. For breaking the calcium select a clear floor space, where nothing can be injured by the moisture, which soon collects on the small pieces which are scattered in breaking. Stand the drum on end and take off the top of the drum by prying it out with an old ax or chisel. It is then an easy matter to cut down the side with an axe, when the sheet iron jacket may be easily removed. The bottom end of the drum may be left in its place until the salt cake is broken and removed. The breaking is accomplished by striking the sides of the cake with the head of an ax or a sledge hammer. Strike near the top with strong, vigorous blows, working around the cake and striking in different places as the calcium flakes off. When the top stratum is broken, take another lower down and proceed as before. It is a very simple and easy matter to break the calcium this way. An active man will prepare and place a drum in an hour or two.

The calcium begins absorbing moisture from the air very quickly, especially in warm, humid weather, and for this reason when a drum is once broken into, it should be disposed of as quickly as possible. The small pieces which fly about when the cake is being broken should be swept up promptly to prevent making a muss; some dry sawdust, scattered over the place where the cake was broken, will be found useful in taking up the moisture which accumulates. As before stated, chloride of calcium is of a similar character to common salt, and aside from the disagreeable property of making everything damp with which it comes in contact, and keeping it so for some time, is entirely harmless.

NEW BOOKS.

KALENDER FUER GESUNDHEINTS-TECHNIKER FUER 1900. Von Herman Recknagel. Muenchen and Leipzig: Verlag von R. Oldenbourg. 1899. 12mo, pocket style; leather cover; pp. 198, and blank pages for notes. Price, M. 4.

Sanitary engineers and those engaged in the construction of devices for heating and ventilation will find this pocket book a very handy companion. After a profuse array of tables, special chapters go into the details of the different methods of ventilation, heating, the construction of bottling, washing and disinfecting plants, etc., giving formulæ, rules and practical examples relating thereto.

[*Translated from the* ZEITSCHRIFT FUER DIE GESAMMTE KAELTE-INDUSTRIE.]

THE REFRIGERATION OF DWELLINGS.

VARIOUS ADVANTAGES—CONTROL OF RELATIVE MOISTURE—COOLING AND MIXING OF AIR—PLANT AT FRANKFORT-A-M.—ILLUSTRATIONS.

BY PROFESSOR E. BRUECKNER, OF MUNICH.

(*Continued from Page 25.*)

[*Synopsis of Foregoing Parts.*—The history in the development of the refrigerating industry is a confirmation of the experience in other branches of mechanics, viz., that they are subject to changes in their original object. The original object of the first inventors of refrigerating devices was the cooling of dwellings, hospitals, etc., but the successful application of the machines was afterward directed in other channels. The failure of these first inventors is largely due to their adherence to the idea of a cold air machine based upon the use of dry air, whereas the air obtainable is saturated with moisture. It was only on the introduction of the use of other gases, such as CO_2 and NH_3 that success began to crown their efforts. Nevertheless, in spite of repeated failures, the efforts in behalf of improvements in cold air refrigeration have been repeated up to the very present. The great developments in the field of refrigerating machinery give promise that the use of these mediums in the cooling of dwellings is not far distant. The objections to be met at present are, first, Can it be done without engendering an unhealthful degree of moisture? and, secondly, Can it be made profitable? The first is answered in the fact that the degree of moisture at all temperatures is already being controlled satisfactorily in our cold storage warehouses. The second, it must be confessed, is the weak point which hitherto, has caused the failure of projects in this direction.]

I CANNOT refrain from touching upon some other advantages, in a certain sense of secondary consideration, forming a special branch of mechanical refrigeration and introduced and tried with brilliant success on the best equipped vessels of the navy and the commercial fleet.

For tropical countries the refrigeration of drinking water is of paramount importance, though I would not attempt to advocate the same for our climate and for dwellings on land. Of greater importance is the possibility of providing refrigerators without ice in various portions of the dwelling, as, for instance, close to or in the kitchen, and in the dining room. On the imperial yacht *Hohenzollern* and on several vessels of the North German Lloyd, fitted up with particular splendor, there are quite extensive plants of this kind, circulating, in well isolated systems, cold solutions of salt or glycerine throughout considerable portions of the vessel, and used for the refrigeration of victuals and beverages, in places where the handling of ice would be impracticable. Systems of this kind could be operated on land, in connection with air cooling apparatus, with a much smaller loss of refrigeration than on vessels, where the pipes frequently must be run through very warm sections.

As a whole, it appears reasonable to expect that the primary and secondary advantages mentioned will lead to the early introduction of refrigerating machines into dwellings.

Without enlarging more upon the probability of a final positive development of cold air ventilation, I shall endeavor herewith to combine the fundamental relations governing the construction of plants such as those under consideration.

It is the general object of ventilation to purify the air in living, sleeping and working rooms, independent of the condition of the outside air, and to reserve the same permanently in the condition most conducive to the health and comfort of the inmates. There are three principal parts to be considered:

1. Preservation of the required purity of the air.
2. Regulation of the volume of moisture.
3. Creation of the temperature most favorable.

The first object is accomplished in all cases, where the outside air is pure, by the simple means of a natural or artificial current of air, while in case of impure outside air, the addition of a filtration apparatus is

required. The performance of the second and third task is usually left to the operation of the heating apparatus. They will be considered as pertaining to the functions of the latter even more, where a negative heating, a room refrigeration, is desired, for, in that case, the two objects cannot be separated. Some people are of the opinion that it is the first requirement in summer to provide for dry air in the room, and that the cooling can be easier dispensed with. This is accounted for by the fact that the air in a room is already felt as oppressively hot when containing a relatively small quantity of moisture that would be considered as altogether pleasant in the open air with a moderate breeze, for the reason that the evaporation of skin moisture is much slower in still air than in moving air. The drying power of air moving at the rate of three *m.* being the same with a relative moisture of 60 per cent as that of still air with only 40 per cent moisture. Every cold air ventilation must therefore be considered a failure, if resulting in a great relative moisture of the air, or going to the extent of effecting a condition of saturation. Simple extraction of heat under constant pressure, however, will always effect an increase of relative moisture, or, when the air is saturated, the precipitation of moisture.

The following table shows the relative conditions under which the first or the latter effect, or both, make their appearance:

Temperature of the Air in °C.	Weight of the Vapor Contained in One Cubic-meter of Air Saturated with Moisture in Grams, at 755 *M M* Air Pressure.
10	9.34
11	9.96
12	10.59
13	11.27
14	11.99
15	12.73
16	13.52
17	14.36
18	15.25
19	16.17
20	17.13
21	18.17
22	19.26
23	20.40
24	21.57
25	22.84
26	24.16
27	25.54
28	26.98
29	28.49
30	30.02
31	31.70
32	33.50
33	35.32
34	37.23
35	39.23
36	41.34
37	43.53
38	45.81
39	48.21
40	50.72

If air saturated with moisture is cooled from 35° C. to 20° C., there is a deposit of moisture from each cubic meter of $39.23 - 17.13 = 22.1$ gram. If the air before cooling contained 60 per cent relative moisture at 104° F., the precipitation of moisture commences with a reduction of the temperature by 10°, for $0.6 \times 50.7 = 30.4$ grams is slightly more vapor than can be contained in air of 86°. In air of originally 86° F. and 30 per cent relative moisture, the moisture, at a reduction of the temperature to 15° C., will rise to about 70 per cent, for $0.3 \times 30.02 = 0.7 \times 12.73$.

The last illustration may serve for cases where, in summer time, fresh air, introduced from without by suction, passes through a cooling system of water pipes and enters the dwelling rooms at the temperature desired for regular use. While, in this case, the effect (70 per cent of moisture) cannot be designated as perfect, there must be very unpleasant results connected with a cooling apparatus of that description in all those cases covered by the first of the above illustrations. A brine pipe refrigerating system, operated under the ceiling of a hall densely filled with people, would be one such case. I will mention two instances of sad experience in this respect—the Royal Court theater at Dresden and the Hofburg theater (Imperial Court theater) at Vienna—were both equipped with brine pipe systems for refrigeration. In the first named theater the condition of the cooled air at times is such that the violins in the orchestra are covered with moisture. It is of no moment, in this connection, whether the refrigeration is effected by the circulation of cold water through pipe systems, or by the extraction of heat from the air, through water flowing down over refrigerating surfaces; for even in the first mentioned case the air does not come in contact with dry refrigerating surface, but only with the vapor deposit covering the pipes, and the contact with moist surfaces will increase the moisture in the air in the same proportion that the temperature is reduced until a condition of saturation is reached. (If the choice is confined to either one of these imperfect methods of refrigeration, the system of refrigerating surface must be preferred to the pipe system, because the construction on a sufficiently large scale is much cheaper.)

The above tends to show that cool, and at the same time dry, air cannot be produced by plants that merely cool warm air to the desired temperature, for it is not alone required that the air be cooled on dry bodies, but the cooling must be accompanied by a drying effect, which requires the presence of matter having the tendency of absorbing the moisture precipitated. The proposition to use caustic lime or other chemical reagents for the drying of the air in mechanical refrigeration appears to be wrong at once, for practical and economical reasons especially, as there is a much simpler method of attaining the desired condition, viz., by mixing warm and cold air. During the lowering of the temperature of a given volume of atmospheric air there is a constant increase in its relative moisture until the condition of saturation is reached, when, under continued cooling, there is a steady decrease in the absolute moisture contained, the same being very small near the freezing point of water, one cubic meter of saturated air at 0° C. only retaining 4.84 grams moisture. If the air, refrigerated to about 0°, is warmed again, after elimination of the precipitated moisture, the absolute moisture contained remains fixed, while there is a steady decrease of the relative one. One cubic meter of saturated air at 40° C., for instance, after cooling to 0°, and rewarming to 40°, will only show 9½ per cent relative moisture. During the cooling (according to the above table) $50.72 - 4.84 = 45.88$ grams of vapor, corresponding to 90½ per cent of the saturation weight, are eliminated, leaving only $\frac{4.84}{50.72} = 0.095$ of

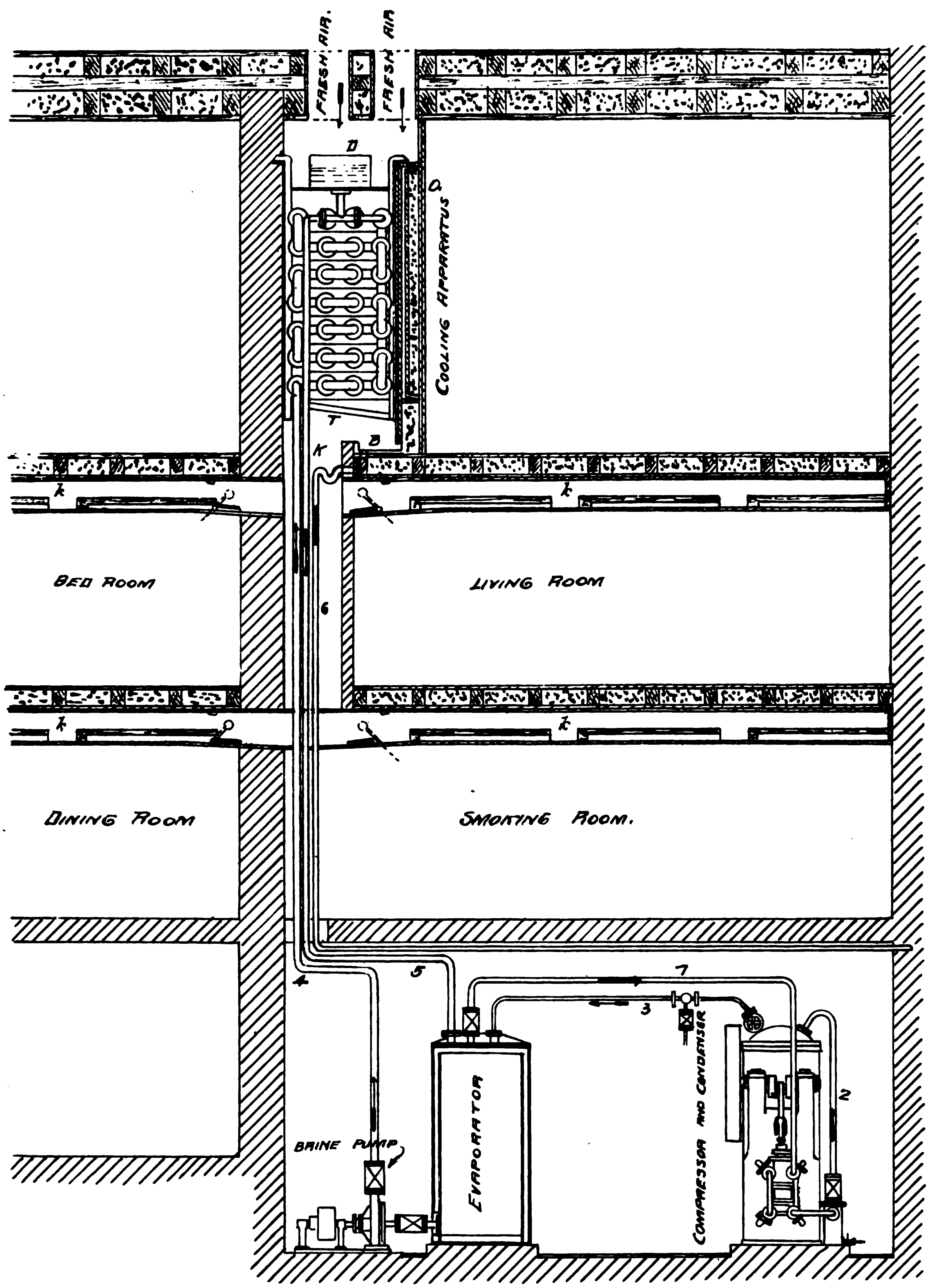


FIG. 1.—PLAN FOR REFRIGERATION OF PRIVATE DWELLING IN GERMANY.

the original vapor weight after restoration of the original temperature, giving the air so treated a large capacity for the absorption of moisture. It is evident that the refrigerated air should not be warmed again by heating, but its capacity for the absorption of heat should also be utilized by causing it to cool fresh warm air. This, of course, is best accomplished by mixing. The process of a perfect cold air ventilation, therefore, includes the following operations: First, sharp cooling of a certain volume of fresh air (to about 0° C.); second, mixing the same with fresh warm air, the volume of which is to be regulated so that the desired final temperature is produced.

While the exact balance of heat of such cooling and mixing process, as actually effected, will be difficult to secure and of little value in practice, an approximate calculation will assist in its demonstration. We will take a temperature in the open air of 30° C., with 40 per cent relative moisture. The volume of fresh air required hourly for introduction into a group of living rooms is to be based upon the general rules of ventilation. If we let about half of this volume pass through the air cooling apparatus, and there cool it to 0° C., the original volume of moisture will be reduced by precipitation to 4.8 grams per one cubic meter. Conducted through air shafts into the

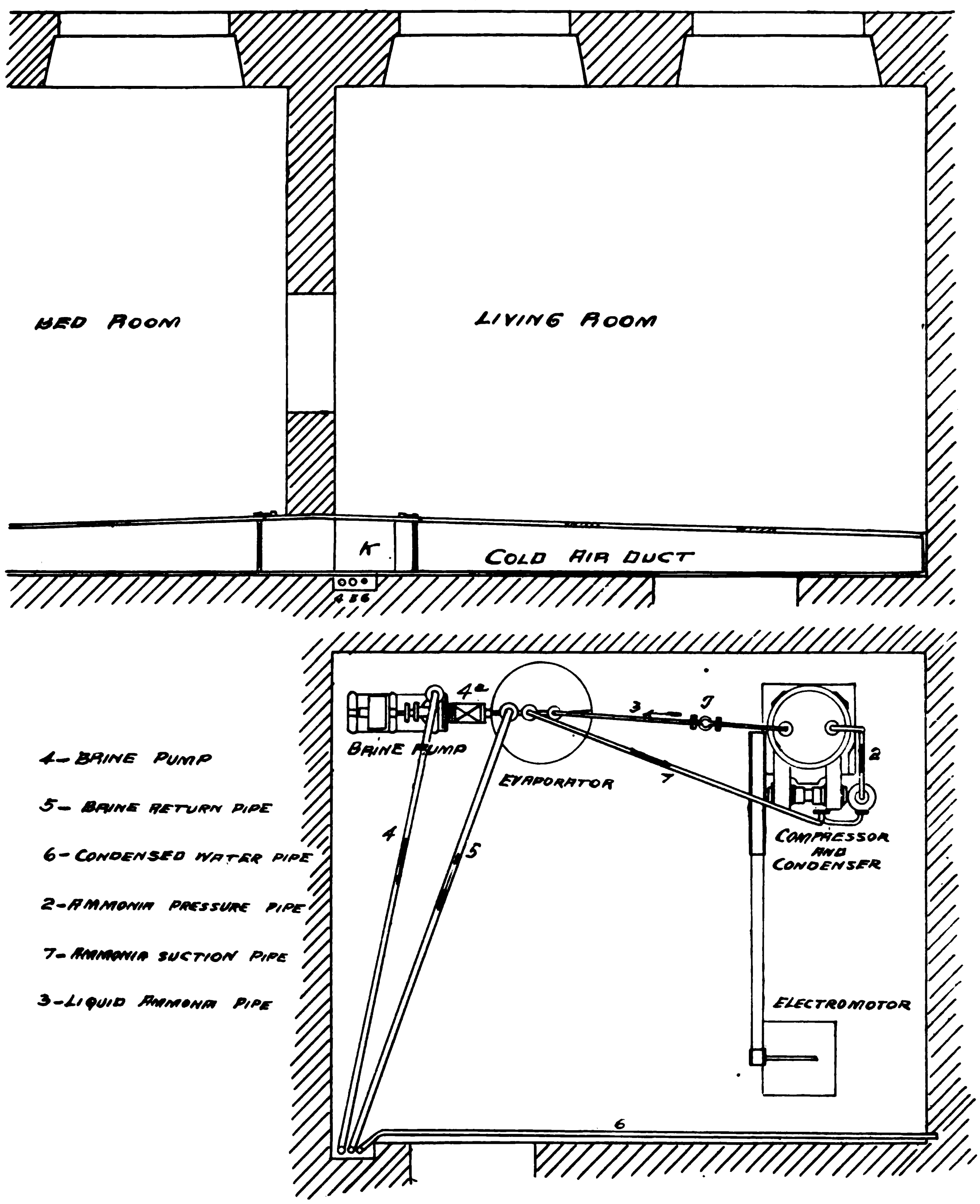


FIG. 2.—GROUND PLAN OF MACHINE HOUSE FOR COOLING DWELLINGS.

different rooms, the cold air first passes along the ceilings and walls of the rooms, absorbing from them the heat penetrating from outside through these conductors, whereby its temperature may rise to about 10°; in this condition it should pass downward from the ceiling into the room distributed as evenly as possible, and there mingled with the other half of the fresh air, conducted into the rooms in its original condition; while there the temperature, after mixing, will be about 20° C. Each two cubic meters of the air mixture will contain $4.8+(0.4\times30.0)=16.8$ grams moisture. The weight of saturation is, at 20° C. 17.13 grams per one cubic meter. The relative moisture of the mixture, therefore, $\frac{16.8}{2\times17.13} = 49$ per cent. A similar result may be shown as regards the temperature. There can hardly be any doubt raised as to the mechanical possibility of such cold air ventilation; but if there should be any, it will be removed by the success of one of the many projects of this kind that has actually been put into effect, to wit, in a plant put up by the Linde Refrigerating Machine Co. in a private residence at Frankfort-on-the-Main. This plant, represented in our Figs. 1 to 4, has been in operation for about six years, and has always given the greatest satisfaction. The following may serve as an explanation for the tables: Fig. 1 shows in a vertical cut the arrangement of the essential parts of the plant which serve to supply four rooms—sleeping, dining, sitting and smoking rooms—with cool, fresh air during the hot season. The cold air generated by a vertical ammonia compression machine (Model B of the Linde company's refrigerating machines), constructed as shown in Fig. 3. This type of machine is intended chiefly for the refrigeration of provisions and drinking water on vessels, the North German Lloyd and the Hamburg-American line having operated a large number of machines of that class on their steamships for many years. The following

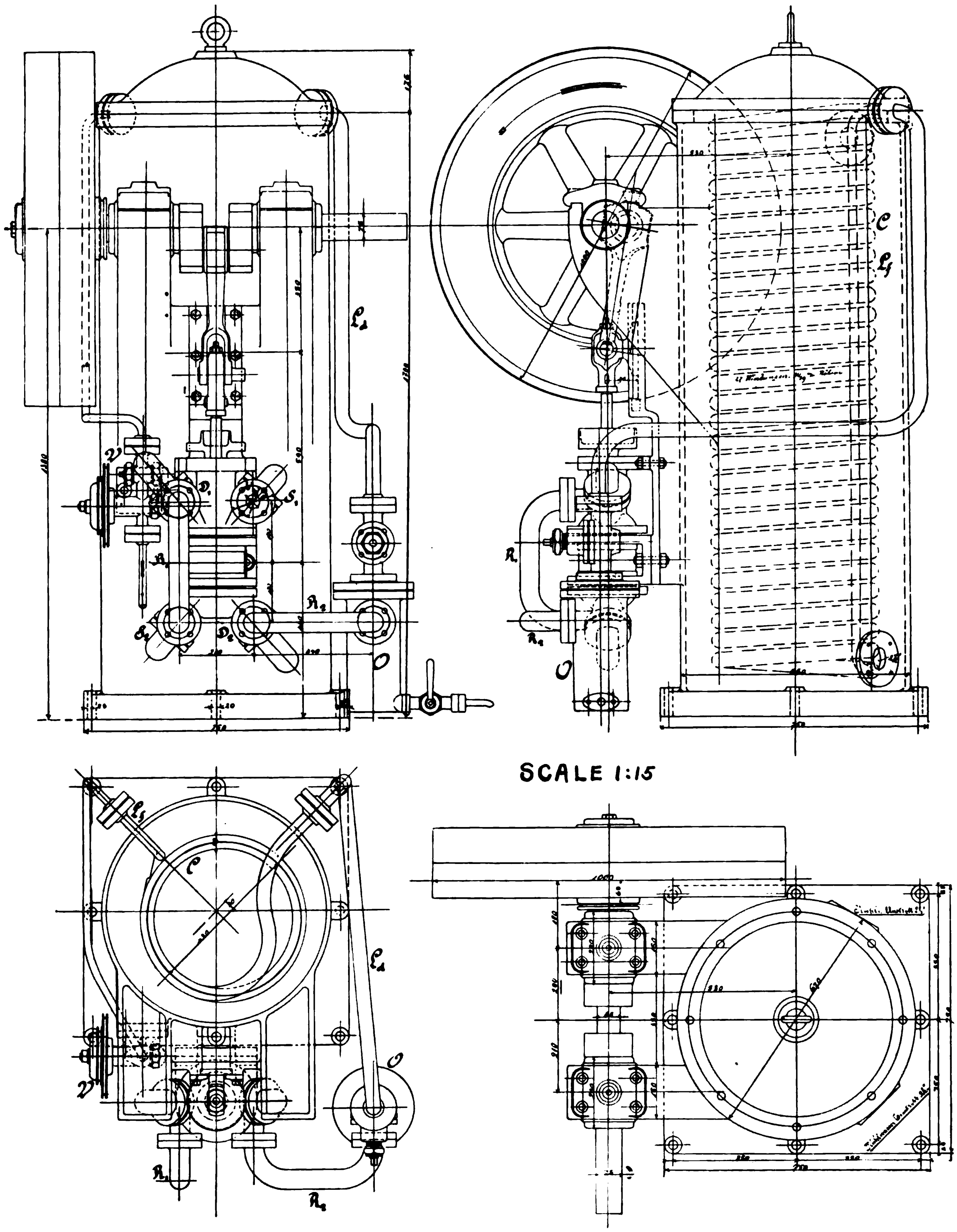


FIG. 3.—VERTICAL AMMONIA COMPRESSION MACHINE FOR COOLING DWELLINGS.

considerations govern the arrangement of the different parts: Greatest possible saving of space, easy control, simplicity and great security of operation. On the small ground space of 0.55 square meters, shown on the drawing, the following parts are located: The hollow cylindrical machine frame carries the compression cylinder, the oil collector, the pressure conductor with stopper, the condenser, the regulating valve and the self-acting evaporator feeding apparatus. The refrigerating process takes place in the following manner: The coil pipe of the evaporator contains liquid NH_3 under moderate pressure (two and one-half to two atmospheres pressure), which receives heat from the surrounding brine at low temperature (5° to 10° C.). The saturated NH_3 gas hereby generated passes through the suction conductor (1) into the compression cylinder, entering first through the suction valve, S_1, into the cover part of the same; at the up stroke of the piston the charge is pushed into the lower side of the cylinder through pressure valve D_1, transmission pipe R_1 and suction valve S_2, and is here condensed to the pressure corresponding to the condenser temperature (governed by that of the cooling water), (eight to eleven atm.). By this arrangement of the cylinder the stop box of the same is constantly under evaporator pressure only, checking the escape of NH_3 at the piston rod, and making the machine one especially adapted for

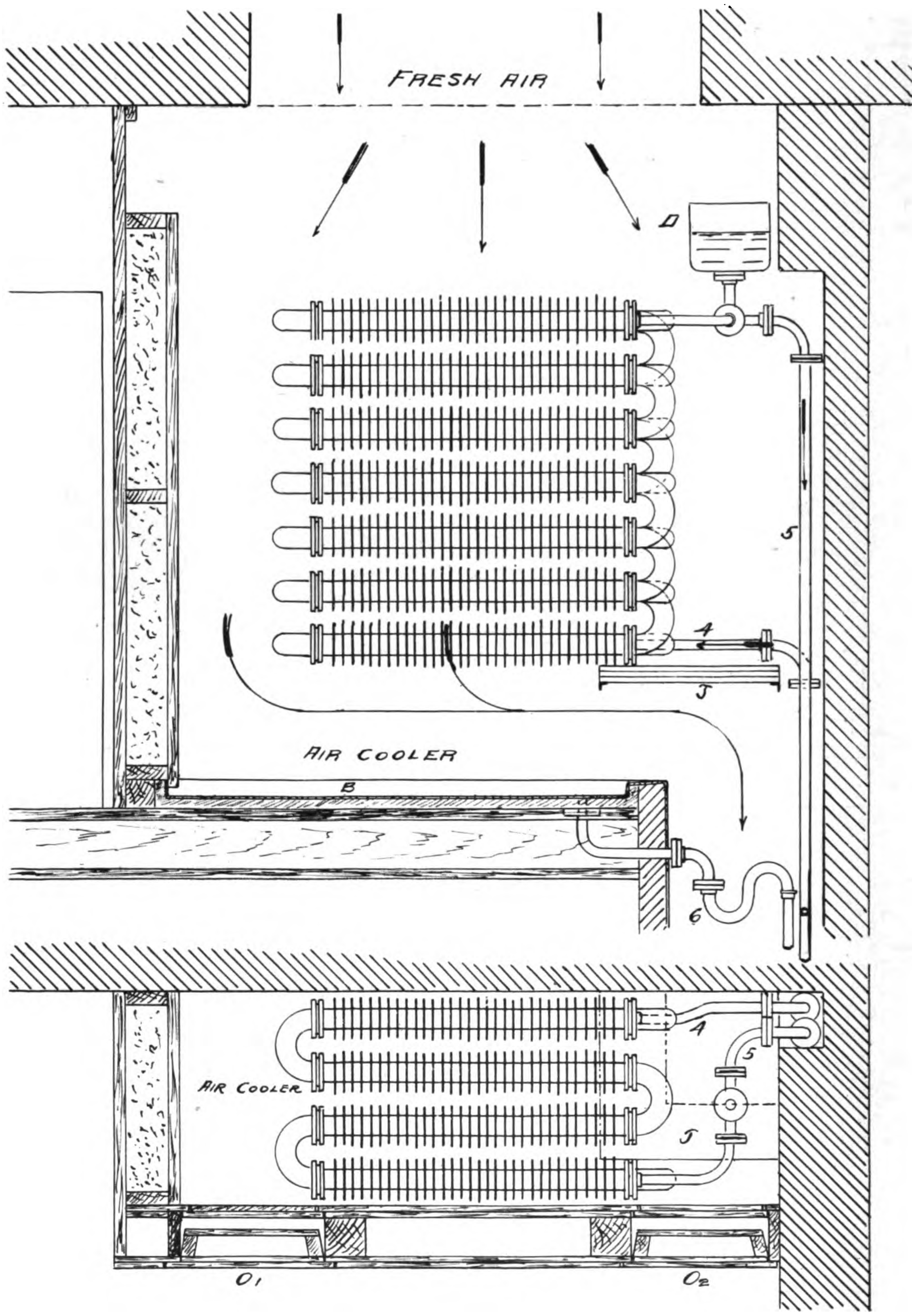


FIG. 4.—AIR COOLING APPARATUS FOR COOLING DWELLINGS.

use in vessels and near dwelling rooms. Through pressure valve D_2 and the pipe R_2 the overheated NH_3 vapor, mixed with oil, is carried to the oil collector, purified and passed through pressure pipe L_4, into the condenser C. Entering the refrigerating coils at the top, it slowly settles into the lower coils, whence it is carried through a thin welded-in pipe, L_6, passing through the usually wide open regulating valve to the self-acting evaporator feeding apparatus. The latter acts in such a way that a piston rotating with the number of revolutions of the machine takes in a certain volume of NH_3 with each revolution, passing the same along through that part of the pipe line which is under evaporator pressure. The heat of vaporization of the NH_3 set free in the condenser is carried off by the cooling water (taken in this case from the municipal water supply), entering at the bottom of the apparatus and passing out, after being warmed, at the top, thus allowing the liquid ammonia to part with as much as possible of its heat by contact with the coldest part of the water. Passing into the evaporator coils through their lowest part, NH_3 is prepared for a repetition of the circuit in the process described. The motive power of the refrigerating

machine is furnished by an electromotor, shown on the ground plan of the machine house (Fig. 2), transmitted to the fly wheel by means of belting. The charging—the renewal of the NH_3 charge—is accomplished by means of a receiving valve system, *F*, inserted in the liquid conductor.

The cold generated is transmitted to the brine, which, after being cooled, settles to the bottom of the evaporator, whence, by means of a centrifugal pump, it is carried through the brine pressure conduit (4) into the air cooling apparatus. The latter consists of a system of ribbed pipes with box *D*, for the equalization of pressure, attached to the highest point. The cooling bodies transmit heat from the fresh air, drawn in over the roof by suction and passing into the air cooler through tin sieves to the brine which, slightly warmed, returns into the evaporator through the brine return pipe (5). In passing along the cooling system the air discharges the greater part of its moisture in the shape of dew or hoar frost. The condensing water, or the water from the melting of the frost deposit, during intervals of operation runs into the dripping pan *T* and the cement basin *B*, whence it is carried off through the drainage system 6, provided with siphon lock. The air cooler is, of course, effectively isolated by insulating walls, forming a box with two openings, the air entrance and the mouth of the cold air shaft leading downward. There are, furthermore, two doors, *O* and O_2, in the front insulated wall which are opened when the ice deposit on the ribbed bodies is to be melted or the latter are to be cleansed. From the vertical cold air shaft *K*, the horizontal air feeding channels *k* branch off in the different stories into the rooms to be cooled. They are bedded in the stucco work of the ceiling, and completely hidden from view; they have small openings along their entire length, through which the cold air is admitted into the room, first passing along the ceiling in horizontal direction, and slowly settling down into the space, finally mingling with the warmer air in the room. The efflux of air through the different openings can be regulated, and the channels, each of them separately, can be closed by a valve, their opening and closing being effected by simply pulling a chain. By careful construction of the air channel system, by tight closing doors and double windows all danger of draft at any place, resulting from an accidental admittance of air, is avoided. The cold air ventilation itself, connected with a proper regulation of the temperature and air distribution, will never result in a draft, but will always have a very pleasant effect. The ordinary domestic help, unskilled in mechanics, is fully competent for the operation of the plant. This one practical experiment in mechanical cooling of dwellings has at least proved that there are elements of success in this as yet so little developed branch of the refrigerating industry.

In the continuation of this paper a basis for calculations as to the volume of refrigeration required for cold air ventilated plants will be given.

——The Home Storage and Manufacturing Co., incorporated, at Elwood, Ind., on the 3rd ult., is the title of a new concern combining all the ice plants and cold storage houses of that city. The directors are: Thomas Connor, P. S. Bradley, B. J. Fettig, Harry E. Johnson and Adam Smith.

LEGAL MATTERS.

LEGAL DECISIONS OF INTEREST TO THE ICE AND COLD STORAGE TRADES, SPECIALLY REPORTED FOR ICE AND REFRIGERATION, BY J. L. ROSENBERGER, LL.B., OF THE CHICAGO BAR.

LIABILITY FOR INJURY CAUSED BY HANGING ON REAR END OF ICE WAGON.

THAT a large cake of ice was jolted out of place, while the horses were trotting up hill, and flew out over the tailboard of the ice wagon to which they were attached, thus injuring a child clinging to said tailboard, the Supreme court of errors of Connecticut holds, in the case of *Walsh* vs. *Hayes*, 44 Atlantic Reporter, 725, did not necessarily indicate any want of ordinary care. It maintains that it was for the trial court to determine, in view of all the attending circumstances, whether a wagon so heavily loaded could be hauled at such a rate of speed over a rough stone crossing with due regard to the rights of those who might be found upon the highway. Here a child nearly five years old, with two other children, had been discovered by the driver hanging on to the tailboard. He shouted to them to get off the wagon and keep away from there, or they would be hurt, waving his hand to them at the same time. The three children thereupon dropped off from the end of the wagon to the street. But immediately thereafter they ran and again caught on to the tailboard. The helper then saw them and shouted to them to get off. Then one of the hind wheels went into a depression in the street, producing a sudden jolt, which caused one of the blocks of ice to bound into the air, slip over the tailboard, strike and injure this child. Only extraordinary precautions, such as the use of a tailboard extraordinarily high, could have prevented any chance of such an accident. No such standard of care, the Supreme court holds, could be required on the part of the ice dealer sued for damages. Nominal damages, however, were awarded for the injury.

A MARVELOUS claim comes from the interior of New York, where an inventor has secured patents under which it is claimed he has perfected a "Monorail" system of transportation, by which he promises to carry mails from New York to Chicago, nearly 1,000 miles, in five hours. The cars, both freight and passenger, are to be suspended from the single overhead rail, and be propelled by means of liquid air (temperature —312° F.). One thousand pounds of liquid air, the inventor claims, will drive a car, which holds fifty passengers or ten tons of freight, 100 miles at a rate of 200 miles an hour.

"FOSSIL Meal," or tripolite, is exploited by some Canadian papers as a suitable material for insulating the walls of cold storage warehouses. As a material for polishing metals, tripoli has long been known. It has also been used to a very limited extent as a covering for steam pipes and boiler surfaces, but for wall insulation it must needs be proved of very superior value or its cost would preclude its use except in the immediate vicinity of the deposits. It was stated that in 1897 Canada exported but fifteen tons of this material, in 1898 1,017 tons, with a rapidly increasing trade. Its excellent qualities as a nonconductor of heat have been recognized.

[*Compiled for* ICE AND REFRIGERATION.]

ENGLAND'S FROZEN MEAT TRADE.

REVIEW OF THE FROZEN AND CHILLED MEAT TRADE WITH GREAT BRITAIN—DEVELOPMENT AND EXTENT OF THE INDUSTRY—MAP SHOWING LINES OF TRAFFIC, ETC.

THE outline map herewith, giving a bird's-eye view of the traffic lines and sources of supply for Great Britain's market of frozen and chilled meat, was reproduced from a larger map issued with the regular annual report or review prepared by Messrs. Weddel & Co., of London, England. As the map graphically shows, England's greatest source of frozen mutton is from her most distant colony, the islands of New Zealand. This colony sent to London during the year ending December 31, 1899, a total of 3,250,100 carcasses of mutton and lamb, against a total of 2,414,718 from the River Plate, and 1,204,601 from Australia. These figures indicate for New Zealand an increase of 365,899 carcasses over the figures for 1898; for Australia a decrease of 44,052, and for the River Plate an increase of 17,381 carcasses over the amount sent in 1898. The receipts of frozen mutton and lamb, indicated in the foregoing figures, represent 27 per cent of all the mutton and lamb available for consumption in the British Isles, or fully eight and a half pounds per head of the population. The trade is still growing in this as in other lines of refrigerated produce, of which only the initial stages have yet been passed.

Messrs. Weddel & Co.'s report calls attention to the fact that the rule holds good perennially that the demand for frozen meats in England slackens in the autumn, and that a neglect to act in accordance with this rule had cost Australasian shippers dearly during the past season. But for this feature the year's trade would probably have been the best on record. London continues to be the sole distributing point for the Australasian trade, while River Plate trade goes also to Liverpool, Cardiff, Newcastle, Hull, Southampton, Manchester and Glasgow. The British Isles also continue to be practically the only market for Australasian mutton, although some shipments were landed during 1899 at Gibraltar and Malta, but there was no Continental trading. The River Plate, which in 1896 marketed 109,473 carcasses at Havre, France, brought there but 25,883, in 1897; 11,000 in 1898, and only 6,498 in 1899.

The trade in frozen beef is given as representing a total of 346,464 quarters from Australia, 86,256 from New Zealand, and 98,016 from the River Plate; showing a decrease from Australia of 13,553 quarters from the record of 1898, an increase of 34,457 quarters from New Zealand, and an increase of 31,144 quarters from the River Plate. The trade in chilled beef from the United States aggregated 2,756,796 cwts., as against 2,301,956 cwts. for 1898. The Canadian trade represented a total of 90,238 cwts. for 1899, as against 21,543 cwts. for 1898. In connection with the American chilled beef trade the system adopted by the largest importers for distributing a great portion of their consignments direct to provincial towns has been largely extended. Not only are single refrigerated car loads sent from ship's side in Liverpool or London to all towns where at least that quantity can be used daily, but depots have been opened in some of the principal London suburbs, from which local retailers can at any time supply their wants.

To supply shipping facilities for the trade in frozen and refrigerated meats, the number of vessels engaged in the frozen meat trade, December 31, 1899, is given as, from Australia to the United Kingdom, seventy-six steamers with an aggregate carrying capacity of 2,942,800 56-lb. carcasses; from New Zealand to London, thirty steamers, total capacity, 2,034,500 carcasses; from both Australia and New Zealand, six steamers and one sailing vessel, combined capacity, 652,000 carcasses; from the River Plate to the United Kingdom, there were thirty steamers engaged, with a total carrying capacity of 1,086,500 carcasses—a grand total of 149 ships, capable of carrying in their refrigerated holds 6,992,800 56-lb. carcasses. Five additional steamers and one sailing vessel are being built for the trade, their combined capacity being given as 277,000 carcasses.

To take care of all this frozen meat on landing, there are now in London seventeen refrigerated receiving stores, with a combined capacity of 1,484,000 carcasses. To freeze the meats and provide storage, pending shipments, there are in Australia seventeen freezing works, with a total capacity for freezing, daily, 34,300 56-lb. carcasses and storing 595,000 carcasses; in New Zealand, twenty-five freezing works, total freezing capacity, 46,700 carcasses daily, and total storage capacity, 1,119,000 carcasses; in the River Plate region, three works, with a total daily freezing capacity of 13,000 carcasses, and a total storage capacity of 285,000 carcasses.

The general outlook for the frozen and chilled meat trade is declared to be favorable, although it is pointed out that while the British imports of frozen sheep in 1899 almost equaled the whole of the flocks of Belgium, Holland and Denmark added together, yet there were few signs, if any, of Continental markets being opened to frozen meat in the near future. It is probable, however, that an increasing demand will be experienced to meet army and navy requirements in all parts of the world. Reports from Australasia and the River Plate indicate varying conditions as to probable supplies in the near future. Australia still suffers from drought. New Zealand expects a favorable season. Strong efforts are being made by the Argentine shippers to increase their output of mutton and beef, the extensions in their various works being now practically completed. From all appearances there should be a fairly good all-round demand for frozen meats; but no doubt the war will interfere with trade in various directions if its course is prolonged, and, therefore, there is more uncertainty in the outlook than there was a year ago.

——The Cuban-American Ice Co., at Cienfuegos, Cuba, whose proposed ice making plant was mentioned in ICE AND REFRIGERATION for November, 1899, will soon have its plant in operation, and report having contracts now on hand for the entire output; also, that it is the intention, as soon as the present plant is in full operation, to build a second and larger plant, adding cold storage facilities. A large number of family refrigerators have been ordered by the company, who expect a good market for them. Refrigerators are almost unknown in Cuba, a tub being used by the Cubans as a substitute. The officers of the company are: President, A. R. Grant; vice-president, O. C. Smeaton; second vice-president, C. B. Penney; treasurer, W. J. West; secretary, O. A. Dockman.

SHOULD ICE MAKERS JOIN TRUSTS?

A CERTAIN tendency toward amalgamations or combinations, popularly termed "trusts," which has swept through certain lines of industry like an epidemic, seems to have found, or to be trying to find, a way among members of the ice and cold storage trades. To be sure, it is not the ice men who are doing this—or, at least, who are taking the initiative—*that* is almost invariably traceable to sets of speculators at the financial centers, commonly known as promoters. These promoters, of course, are disinterested parties who aim simply at the "good of the trade." They have no "ax to grind," they look not to personal gain at anybody else's expense, they are simply philanthropic gentlemen who have a clearer insight than other folks into the needs of the business, and give their talents for the general welfare. Everybody knows that! Their arguments are plausible, their presentation of the case attractive. But men of business do not judge of a course of action by its *ideal*, but by its *practical*, consequences.

Practically, "trusts" have not turned out to be as advantageous as the visionary promoters prophesied. Years ago the brewers were overtaken by the trust epidemic. For a very few seasons the trust stocks were quoted high, comparatively. But ever since they have been going down, down, until now preferred stocks that five or ten years ago were quoted at 80 are now 25 or 30; some that were par and over are now 40 or 45, some less, much less. Every possible scheme was tried to bolster up the falling quotations, but in vain. The open market is a sure criterion of actual values, not of the values claimed in the prospectus, or the report. In other words, the trusts are disastrous for the holders of trust stocks.

In the ice business the "trust" idea is yet new, but the contagion seems to be spreading. The economies to be secured, as presented by the wily promoter, are attractive. It is better to become an employe of the trust, get some ready cash and be a stockholder in a big concern, than to run a small ice plant. The people in the ice business have not yet learned by experience that "things are not what they seem," and that the promises of promoters are not always kept. Nor yet that results which seem so very plausible on paper, and really cannot be successfully controverted, do not always turn out as well as expected, even when liberal margins for safety have been allowed. That promises are not kept is illustrated in the serious complaints coming from New York, where individuals, who sold out to the ice trust under the agreement that they were to be retained in its employ, now declare that just when they thought their berths were secure notice was received that, "their services were no longer required."

The natural ice people have had a brief experience, not long enough to serve as a precedent. The Knickerbocker, the Consolidated, or its successor, the American Ice Co., are held up as shining examples. Still it must not be lost sight of that the case is different in the natural ice field. Here the sources of supply are comparatively limited. It is possible for a "trust" to secure a monopoly of the sources of supply, and indeed this is what they seem to be aiming at. But with the manufactured ice business this would be virtually impossible. Ice machines can be had and can be operated by skillful parties anywhere and at any time. A natural ice trust *may* monopolize the natural ice market. An ice factory trust would find it impossible to monopolize ice making.

The idea of forming trusts is in its nature a speculative movement, having its periods of rise and fall. Their ultimate success is in the highest degree problematical. Making great pretense at economy, in the end they are not economical, and hence fail. The economies secured by lessening cost of distribution are eventually overbalanced by the burden of adverse legislation, which is constantly being made heavier, and by the additional burden of over-capitalization, which, under the present system of promotion, is a *sine qua non*. Prof. Bemis, a recognized statistical authority, states that for trusts in this country capitalized at over $8,000,000,000, the cost of duplicating all their plants would not be over $3,000,000,000, and probably they cost less. The plant of the paper trust, capitalized at $55,000,000, represents an investment of but about $15,000,000—$40,000,000 of watered securities to absorb profits. The American Malting Co., capitalized at $30,000,000, represents a series of malting plants in various parts of the country which could all be duplicated to-day for about $5,000,000. Hence, it is no wonder that the stock, which one year ago was quoted at 87 for preferred and 33 for common, can now be bought for 27 and 7. The ice combine formed at New Haven, Conn., last month, is capitalized at $500,000. The appraised value of all the plants, as given by their owners, is $308,000. At Paterson, N. J., the combine capitalized at $600,000 represents plants estimated to be worth about half that sum, or less.

It seems absolutely certain that ice trusts loaded with the burden of great bond issues and vast watered stocks, and handicapped by adverse legislation and the necessity for costly legal fighting to maintain every advantage, will not be able, after a short time, to compete successfully with independent manufacturers whom they can no longer afford to buy up at ruinous prices; and then will come the deluge. For these and other reasons, we feel constrained to urge ice manufacturers, who are asked to sell their plants to a trust, and offered prices that make it a good proposition to sell, to demand at least two-thirds or three-quarters of the purchase price in cash.

ANOTHER LIQUID AIR CO.

THE Connecticut Liquid Air Co. has been organized at New Haven, Conn., incorporated under the liberal laws of West Virginia, with a capital stock of $1,000,000 in $10 shares, and has opened offices for the sale of stock. Representatives of a New York liquid air corporation have been working in various interior cities recently to secure customers for about $500,000 worth of stock in order to erect liquid air plants in New York, London and Paris. As long as prospective investors are aware of the real nature of this exceedingly cool, interesting but evanescent agent, it will do no harm if they sink a few thousands in experiments, and they should by this time certainly have their eyes opened to the limitations of this aerial substance for practical purposes.

ANSWERS TO CORRESPONDENTS.

TO FIND AMMONIA LEAKS—STORING EGGS—REMEDY FOR LEAKY TANKS—MANAGING COLD STORAGE—REMEDIES FOR VARYING TEMPERATURES IN COLD STORAGE ROOM.

[This department of ICE AND REFRIGERATION is conducted for the benefit of the trade generally, as well as individuals; and all competent inquiries will be given timely and proper attention, precedence in all cases being given to such questions as are of general rather than of individual interest. Correspondents will please write only on *one* side of the sheet. Persons desiring to communicate with correspondents using this column will do so by addressing them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago. All communications to this column are treated as confidential, and the names of the writers will not be disclosed without their permission. Anonymous communications will not be answered in this column.—ED.]

TO FIND AMMONIA LEAKS.

To the Editor: Will you please inform me how to detect an ammonia leak in the brine tank? Where can I find the material to test for the leak? I am running a plant that is about one year old. I have searched the place over for leaks, but find none, but still my ammonia gets away from me. Can it be that there is air in the system, and that the ammonia is decomposed? I have had to charge the machine twice this season. J. B. E.

ANSWER.—To detect the presence of small quantities of ammonia in the water or in the brine in brine tank, Nessler's solution is the best reagent. A few drops of this, added to a little brine in a glass tumbler, will produce a yellow coloration in case only traces of ammonia are present, and a dark brown color if larger quantities of ammonia are contained in the liquid. If your druggist does not keep this solution, he can prepare it for you after the directions given on page 103 of "Compend of Mechanical Refrigeration." This book also contains considerable information on the decomposition of ammonia in refrigerating machines, and by examining it you will be able to tell whether or not there is any danger from this source in the operation of your plant.

STORING EGGS.

[A further reply to the query of "A. S. R.," in the December issue of ICE AND REFRIGERATION, regarding the storage of eggs without the use of refrigerating machinery has been received from a practical egg dealer of many years' experience, Mr. J. F. Miller, president of the Linfield (Pa.) Cold Storage and Ice Co. and of the firm of Sickel & Miller, egg dealers, Philadelphia, whose suggestions and experience may prove of value to our readers.—ED.]

REPLY.—I read everything in ICE AND REFRIGERATION, and am amused at some of the questions and answers, especially on egg storage. In yours of December, page 407, answering A. S. R., under "Storing Eggs," tell such an inquirer right out that he cannot keep eggs good for such a length of time, by any process, except in first-class cold storage. I speak from the standpoint of a practical egg man, with thirty years' experience, having tried all kinds of experiments with eggs, and paid very dear for some. Being largely interested in eggs and cold storage, I become disgusted when I read about people trying to preserve eggs a long time with coatings of vaseline, paraffine, oils, varnish, salt, ashes, bran, dry lime and what not. In your answer you state that the taste of the egg would be destroyed, which is a fact, and a very good reason why the plan should not be used at all, for the country has plenty of bad and tainted eggs, and the proper thing to do is—improve on the plan of holding in cold storage, and use no other system of preserving, not even liming. There are many persons in the country who raise eggs, but know nothing of the nature of them, but as soon as they receive some simple plan on preserving, they start in to be speculators, spoil the eggs and then mix them with fresh gatherings, palm them off on the country storekeeper, he, in turn, on the shipper, until the trash finally finds its way to the city markets and causes great trouble and hard words among egg receivers and dealers. Physicians and the board of health, I think, are not the people who know as much about eggs, and the keeping quality, as a practical egg man; there is a great difference between theory and actual practical experiments.

In my experimenting, I have found that all conditions must be met, to have perfect, well kept eggs. In the first place, we want fresh, new laid eggs, and a clean, tasteless or odorless package, in which to place them, and then a good, clean storage room for them. I believe in packages that are not made entirely tight, in an egg room without any pipes, cold air to drop in the center, and the up-takes on each side of the room. I believe in a 30° temperature, and in such a room, in the Linfield cold storage house, I tested ten cases of April eggs, for just twelve months, and it was surprising. Of course we all know it is uncalled for to keep eggs that long. I am convinced there is no egg case filler made, for storing eggs, that will equal the odorless filler, made at Shippensburg, Pa. My first experiment was with 500 sets, the next season 12,000 sets, the following season 16,000 sets, and this year I used over 20,000 sets for April and May eggs, and our goods have the highest reputation on the Philadelphia, New York or Boston market, and even in Liverpool and London.

These facts may perhaps show you something of which you have not been aware. I am not an engineer or ice machine man, but simply a plain egg man, and for years the chief egg inspector of the Philadelphia Produce Exchange, which position I still hold.

In reference to your article on Dr. Isabel Mitchell (page 414, December issue), alas, it is true; but her secret did not die with her, for I have it, and paid for it, and in 1881, when I tried several experiments with her process, and let her and her man do all the preserving, I told them they would never succeed, nor be able to do what they claimed. When she wanted to try the third experiment, I proposed each putting up a forfeit of $500 with a trust company, and if she succeeded, she was to have my $500, but this was declined; and I even offered to make the test for only two months in the year, giving her the choice of the season.

REMEDY FOR LEAKY TANKS.

To the Editor: We are having trouble with our brine tank. It is built of cypress wood, and has been in use four years. For the last year or so the salt has been coming through. The insulation around the tank is sawdust, and outside of that is a 9-inch brick wall. The salt comes clear through the bricks, and we are at a loss to know what to do to stop it. Can you inform us what should be done in the matter, and what attention we should give the tank? E. B. Co.

ANSWER.—There are two ways in which your wooden brine tank can be made tight, either of which will answer for a time, but we cannot warrant that either will be a permanent and entirely satisfactory solution of your trouble. *First,* it will be necessary for you to take out all of the coils from the tank, and then dry out the wood by placing a salamander in the tank and keeping it burning until all of the surface is

MANAGING COLD STORAGE.

To the Editor: We have not been in the cold storage business very long, and are particularly attracted by the department of your paper, "Answers to Correspondents," hoping to get information from you where we are ignorant.

We have the brine system. The brine pipes in the rooms, of wrought iron pipe, are very rusty, and the condenser coils are also rusty. The latter are made of extra heavy pipe. Would it be economy to paint these pipes, or would it be such a long time before they would rust through as not to justify the cost of painting them and keeping them painted? If you think they should be painted, what paint would you use?

We would like to know the best temperature for keeping eggs, and how much above and below that the temperature may go without injury to them, also whether a circulation of air is absolutely necessary. We have been keeping apples very well in a cellar where there is no special ventilation, and we thought that might be a good place for eggs. How often should eggs be turned to prevent settling? And can you tell us whether it is true that, in warm weather, if produce be gradually brought up to the temperature of the outside air and then taken out of cold storage, it will then keep as well as if it had never been in cold storage? L. A. J.

ANSWER.—It is certainly good economy to paint your brine pipes. There are several good paints on the market for this purpose, and advertised in ICE AND REFRIGERATION.

The best temperature for keeping eggs is about 32° and 33° F. English packers go as high as 40° to 45°, and American packers go as low as 30°, but in the latter case the germ in the egg is killed, and for that reason they will not keep as well after withdrawal from cold storage as eggs stored above the germ freezing temperature. On the other hand, we think it is rather risky to go above 35° F. Eggs stored at 30° or below hardly need any turning, as the position of the contents is fixed by congelation; but for eggs stored above the freezing point it is recommended that they should be turned twice a week.

The gradual bringing up of the temperature of goods withdrawn from cold storage will contribute greatly to their future keeping, and, although it will not bring their keeping qualities fully up to that of fresh goods, it is a very great help in that direction, and should not be omitted with tender goods, more particularly not with meats. We think a circulation of air is not absolutely necessary if the air is originally pure and if the proper degree of moisture can be maintained without it.

REMEDIES FOR VARYING TEMPERATURES.

To the Editor: We have considerable trouble with our cold storage rooms. During cold weather the temperature falls 4° in eighteen hours, with no expansion on them. Rooms are 19×30×10 feet, and are insulated as follows: Steel siding, building paper, two layers of matched boards with building paper between them, 2-inch air space, and two layers matched boards with building paper between them. In center of ceiling there is a 6×6-inch ventilator. We use the angle thermometer, same coming through wall four and a half feet from floor. During warm weather it is 4° colder on floor than at thermometer; pipe is on side of room. Kindly inform us what is wrong with rooms and how we can remedy same, and oblige H. M. W.

ANSWER.—Regarding the trouble you are having with temperatures of cold storage rooms, would say that from your description of the insulation of the room, we are certain that the source of the trouble is in the insulation, or rather in the insufficiency of the insulation. Your description covers a construction of insulation with only one 2-inch dead air space, in a wall about six inches thick, and that space not filled with any insulating material. Where dead air spaces only are used in the construction of cold storage insulation it is considered good practice to construct not less than three dead air spaces, having double boards and double paper, the paper laid one-half lap, between and outside of the spaces; and where the buildings are constructed entirely of wood—as we take it your building is—the usual practice is to fill either the center or the two outside spaces with granite rock wool, mineral wool, asbestos, cork, hair felt, insulating "quilt," sawdust, dry mill shavings or other good insulating material, as wooden buildings are more apt to warp out of shape, and consequently destroy the dead air locks, than brick or stone buildings are. It is, therefore, desirable to have at least one of the spaces of wooden buildings filled with some good insulating material, that is light and elastic, as in case of the building warping the filling will prevent admission of warm air to a considerable extent. We would advise you to increase your insulation by furring up on the inside of the rooms with two-inch furring strips, covering the same with double boards, with double paper laid half lap between the boards, and then a second course of furring strips and double boards with double paper laid half lap between, and filling the center space with some first-class elastic insulating material, as suggested above. Both the ceilings and floors of the rooms should be well insulated, as it is essential that the heat should be shut out from every surface of the space refrigerated. If your insurance rules will permit we would advise taking the steel siding off the building, and replacing the same with furring strips, rough boards, double course of paper and first-class ship lap siding, leaving the outer space between the furring strips open at both bottom and top for a space of say six inches, so that the heat transmitted from the direct rays of the sun will have a chance to pass up and out and be replaced with cooler air at the bottom; this will keep the wall cooler than if the siding is tight all the way up. We would call your attention to the articles on insulation construction in the previous numbers of ICE AND REFRIGERATION, which will give you valuable information regarding proper construction of insulation. The fact that your cold storage rooms have run down 4° without any circulation in the cooling surfaces, and the further fact that the temperature of the rooms at the floor level is 4° colder than at a point four and one-half feet from the floor in summer time, when the circulation is on, is proof conclusive that the insulation is materially defective, as there should be no such wide divergence of temperature in so short a space of height. Possibly, also, your piping is not located to the best advantage. Ordinarily when all of the piping is located on the sides of the rooms the most frequent complaint is about sweating and dripping ceilings. The warmer and most humid air is driven up to the ceiling by the force of the cold air currents from the pipe surfaces falling directly to the floor lines and getting under and forcing the warmer air upward in direct lines, consequently when the humid air meets with a condensing surface, such as a ceiling, the moisture is deposited on the ceiling and the result is almost universally wet and dripping ceilings. A few runs of cooling pipes near the celiing will correct this evil.

ICE COMPANIES COMBINE.

FOUR of the leading ice companies at New Haven, Conn., have been consolidated and will be operated by a new corporation to be known as the Hygienic Ice Co., incorporated with a capital of $500,000. The companies comprised in the deal were the Hygeia Ice Co., the Consumers', Burton Dickerman, and Upson & Grannis. Herbert E. Barnes is to be president of the new company; Geo. E. French, secretary; W. E. Miller, treasurer, and F. H. Snell, general manager. The use of automobiles for ice delivery is being considered by the new concern. Among the seven ice companies in New Haven not in the combine are the New Haven Ice Co. and the Woodbridge Ice Co., both operating extensive plants.

At Paterson, N. J., the attempt to amalgamate all the ice interests failed, the consolidation finally effected leaving out the North Jersey and Pocono Mountain Ice Co., who supply somewhere near one-fourth of the total demand of that region. The new combine has been incorporated as the Paterson Consolidated Ice Co., with a capital of $600,000. The officers are: Peter H. Hopper, president; Phineas Bridge, vice-president; Ph. Geyer, second vice-president; A. H. Henderson, secretary, and Thomas Alyea, treasurer. The plants included were known as the Passaic Ice Co., Haledon Lake Ice Co., Alyea Bros., Henderson Bros. and Philip Geyer.

Reports from Omaha, Neb., indicate that the ten ice companies doing business there have been consolidated or merged into a single concern with a capital of $200,000, of which Edward Cudahy, of the Cudahy Packing Co., is general manager.

At Cincinnati, Ohio, where the former arrangement with the Ice Delivery Co. has expired by limitation, plans have been made to form a general consolidation or purchase of the individual plants by a central organization. The promoters, who are said to be New York people, were informed that it would require at least $2,000,000 to secure the nine plants of this city.

The attempt to bring about a consolidation of ice manufacturing plants in southern cities, mention of which has been made in former issues of ICE AND REFRIGERATION, is still in the hands of the promoters. Rumors of a gigantic deal, whereby certain Wall street speculators and the American Ice Co. are to gain control of all the principal natural and manufactured ice plants in the country, continue to float about in a more or less hazy manner, and find some credence among credulous persons.

NATURAL ICE NOTES.

——The City Ice Co., Minneapolis, Minn., is erecting two new ice houses at White Bear lake, to cost $40,000.

——The Union Pacific Railway Co. is building an ice house at Evanston, Wyo., 160×106 feet in size, forty feet high.

——The Ross Ice Co., Bangor, Me., it is stated, is putting up three additional ice houses at Bullseye bridge on the Kenduskeag.

——The Mountain Ice Co. of Salt Lake City, Utah, is improving its plant so as to treble the storage capacity and improve the transportation facilities.

——McBride Bros., of Chicago and Elgin, Ill., have purchased a site on the Fox river near St. Charles, and will erect thereon an ice house capable of storing 15,000 tons of ice.

——Gilfroy & Newton, at Macomb, Ill., purchased the ice business of Gesler & Son at that place, including all the ice house tools, franchises, rights, etc., belonging to said firm.

——The firm of Porter Bros. & Co., ice dealers at Brockton, Mass., has been dissolved by mutual consent, and a new firm, to be known as Porter Bros., will carry on the business.

——The Glens Falls Providing Co., at Glens Falls, N. Y., is a new company formed by Albert C. Johnson, Earl Smith and others to engage in the ice business. The company has been incorporated with a capital of $10,000.

——The Parley's Canyon Ice Co. has been organized and incorporated at Salt Lake City, Utah, by members of the Sawyer family, with A. B. Sawyer president. Capital, $3,000. It is intended to build a plant and harvest ice from Parley's creek.

——The Consumers' Ice Co. at Springfield, Ohio, was dissolved December 11 last, and the business theretofore conducted by the Consumers' Co. has since been conducted by the Springfield Coal and Ice Co. and Beckley & Myers, separately.

——The Lake Contrary Ice and Supply Co. has been organized at Atchison, Kan., to harvest and deal in ice. Capital, $5,000. The directors are Charles Crawford, Frank J. Thomas, N. J. Fletcher, and Geo. E. Balcom, of Atchison, and G. W. Closson, of Topeka.

——The Highland Co-operative Ice Co., Boston, Mass., a new concern, organized under the laws of Maine, has acquired the property and rights of the Highland Ice Co. and of the Jamaica Plain Ice Co. of Boston, virtually consolidating these two companies. The business is to be carried on on co-operative principles.

——The Kerber Lake Ice Co., of Sandusky, Ohio, has acquired all the property of the Waterfield Ice Co. for $15,000. As a result the Kerber company has decided to increase its capital stock from $20,000 to $35,000, and the officers of the reorganized company will be Frank A. Kerber, president; John Knauer, vice-president; John Kerber, treasurer; Edward Kerber, secretary and manager.

SOME COOL CLAIMS.

PROF. TRIPLER still insists that he can make use of the first liquid air produced in his machine to make additional liquid air without the expenditure of additional force. A company which claims to be backed by abundant capital has petitioned the navy department at Washington for permission to raise the wreck of the *Maine* in Havana harbor, claiming that this can be done readily by means of liquefied air. These claims may be termed plausible, but the most delightful claim comes from a resident of one of the suburbs of Chicago, and is expressed by the author as follows:

> I claim to have a scheme of perpetual motion. I use compressed air extracted from ice. It has been said that ice contains but 4 per cent of air, but I can get much more than this out of it. I have developed 2,500 horse power from ninety pounds of ice per hour, and 1,500 pounds will last the machine ten hours. I use no ammonia, and can freeze enough ice while working the machine to supply all the air necessary. the plan is to suck the air from the ice by a fan, which supplies pumps that compress the air into a boiler. This boiler acts as a storage tank for the accumulation of the necessary head. The air, working under heavy pressure, is piped to the engine, which operates the fan and the pumps. Enough compressed air can be taken from the boiler additional to this to freeze the ice necessary. My machine will furnish power in large quantities for any purpose.

It appears that the many uses of ice have been only partly understood heretofore. In addition to its refrigerative powers, it has perpetual motion locked up within its cells. But the author fails to state whether or no his scheme will work with manufactured ice, from which the air bubbles have been as far as possible excluded.

OFFICIAL NOTICES

OFFICIAL.

SOUTHERN ICE EXCHANGE.

The eleventh annual convention of the Southern Ice Exchange will be held at Mobile, Ala., February 22 to 24, 1900.

PROGRAMME OF THE MEETING.

Thursday, Feb. 22.—Opening at 10 A. M. in German Relief Association hall. Address of welcome by Hon. J. C. Bush, mayor of Mobile, Ala., followed by business session.

2 P. M.—Boat excursion on Mobile river and bay. Lunch aboard steamer.

Friday, Feb. 23.—Session opens at 10 A. M. General discussion.

3 P. M.—Trolley party about Mobile and suburbs.

9 P. M. Banquet at Battle house.

Saturday, Feb. 24.—Business session at 10 A. M.

1 P. M.—Lunch and reception at the Mobile brewery. Adjournment.

HOTEL RATES.

Battle house (American) $2 50 to $4 per day.

Windsor (European) $1 to $1 50 per day.

New Southern (European)—75 cents to $2 per day.

Klosky's (European) $1 per day.

Headquarters, Battle house. Bureau of information, Room 16, where the members are requested to register promptly upon arrival.

RAILROAD RATES.

The members of the Southern Ice Exchange can obtain a rate of one fare for the round trip by calling for *Mardi Gras* tickets to Mobile, Ala. These tickets will be on sale north of the Ohio and Potomac rivers beginning February 19 after midnight of the 18th, south of the territory including Washington, beginning February 20 (after midnight of the 19th). This will give all who attend the meeting ample time to reach Mobile by the morning of the 22d. No certificates are necessary.

Mardi Gras takes place in both Mobile and New Orleans February 26 and 27. Those who wish to see it at Mobile can remain there or, if they prefer, they can go to New Orleans—round trip from Mobile to New Orleans being $4 20.

The first floor of Association hall has been secured for exhibits. Samples or models sent to the care of Mr. A. S. Lyons, at Mobile, will be properly looked after.

COMMITTEE OF ARRANGEMENTS.

A. S. LYONS, Chairman.

A. KLING.	H. W. FRENCH	JNO. BARRICH.
I. LYONS	J. B. WEBSTER.	L. A. PARTRIDGE.

RECEPTION COMMITTEE.

PAT J. LYONS, Chairman

L. P. HART	J. G. JENKINS	GEORGE A. POITZ
S. J. WHITESIDE.	G. E. AUSSPRACH	SAMUEL LATHAM.
D. P. BURNS	A. G. LEVY	A. N. HILL
R. W. HOPKINS	A. H. STEIN	CHAS. TOBLER
RICH. MULLEY	W. S. DAVIS	C. J. MICHAELOFSKY

AN ingenious arrangement to prevent overcrowding of stairways and elevators when entering or leaving a building is used in the main office of the International Correspondence Schools, Scranton, Pa. The time of entering and leaving the building is regulated by clocks on each of the five floors. On the lower floors the clocks are set correctly, but on the upper floors they are a few minutes slow, so that the employes on the lower floors are at their desks before those on the upper floors are due at the building. In leaving the building the employes on the upper floors do not leave their desks until several minutes later than those on the lower floors. Over 500 people are employed in the building.

PACKING HOUSE REFRIGERATION

IN a paper submitted before the National Live Stock Association at its meeting in Fort Worth, Tex., on the 17th ult., Mr. Phil. D. Armour, of Chicago, drew a parallel between the development of the modern packing house and the cattle trade. "To the modern packing house, coupled with modern refrigeration," he said, "may be traced the marked recent development and creation of the great cattle markets." One of the most important advantages that have been gained through the great centralized packing establishments is to be found in the utilization of "offals" thus made possible. A Chicago packer recently remarked: "The by-products of a steer are worth more to us than the beef which we get from the animal," while another laughingly remarked: "We let nothing about a pig go to waste except its squeal, and a machine is now being built for canning that, so it can be used for Fourth of July celebrations." However, it must not be lost sight of that the problem of transportation and preservation had to be solved first before the other could prove successful, and that was accomplished by means of the refrigerating machine.

PACKING HOUSE NOTES.

—The Paisley Pork Packing Co., of Paisley, Ont., has been organized by local merchants. The share capital is $8,000.

—The Henry Kohrs Packing Co., Davenport, Iowa, is having its packing house equipped with direct expansion piping, supplied by the Frick Co., of Waynesboro, Pa.

The Newport News (Va.) Abattoir Co. has begun the erection of its proposed abattoir and ice making plant. The slaughter house is to have a capacity of 1,200 beeves and 2,000 head of sheep daily.

—The Frye-Bruhn Co., packers, Seattle, Wash., who are completing the rebuilding of their plant, have recently contracted for a 30-ton Harris refrigerating machine, to be installed at the new works.

The North Packing and Provision Co., Somerville, Mass., is equipping its plant with direct expansion piping, the contract for which was awarded to the Frick Co., of Waynesboro, Pa.

The town authorities of Harriston, Ont., have asked authority from the Canadian legislature to grant a bonus of $20,000 to the Harriston Pork Packing Co., the money to be raised by the issue of debentures.

England imported from the United States during the year 1899, 321,229 head of cattle, 68,562 less than during 1898; 121,650 sheep, a decrease of 55,992; 2,756,790 hundredweights of fresh beef, an increase of 701,801 hundredweights over 1898.

The Hammond Packing Co., of Hammond, Ill., Omaha and Kansas City, have leased property at Salt Lake City, Utah, for office and storage purposes, and will build there soon, it is asserted, a branch warehouse, to be equipped with refrigerating machinery.

—Smith Bros., Urbana, Ill., are building a house [illegible] feet in size, to be equipped and used for slaughtering purposes, also a cold storage house. The plant is designed to be used by all the butchers of Urbana. The cost of buildings will be about $[illegible].

Buffalo steaks which had been in cold storage at the Dold Packing Co.'s plant at Wichita, Kan., for thirteen months were sampled recently, and the meat pronounced tender and succulent, and in every way improved by the long stay in cold storage. Buffalo meat as food is becoming extremely scarce, and the portion of it remaining in cold storage will [illegible] value. Its preservation in the cold storage is practically assured. It was asserted that the Jacob Dold Packing Co., at Kansas City, Mo., has held meat in cold storage for over four years, which then proved to be still in good condition.

REFRIGERATION ABROAD.

ICE CONSUMPTION OF LONDON. A NEW PROCESS OF MAKING CONDENSED MILK. MISCELLANEOUS FOREIGN ITEMS.

AN article on the ice consumption of London in a recent number of the British *Penny Magazine*, giving some interesting descriptions of the "ice wells" or ice storage rooms in the metropolis, gives the annual consumption of ice in London at over 200,000 tons, comparing this with the 5,000,000 tons used in New York. As to the distribution of ice in London, that is done by specially constructed ice carts drawn by horses, each doing its own round every day. The man in charge has to bring back his ice or the money for it, an allowance being made for leakage. The great customers are the butchers, the fishmongers, hotels and restaurants and confectioners, not to mention hospitals and infirmaries. Anywhere on the line of route the small householder may hail the ice cart and buy a small quantity, though in practice he usually patronizes his fishmonger. "Practically all the ice we get," says the writer, "comes from Norway, from which country we take, perhaps, the largest share of its total export of this commodity. There is no sign that the various methods of manufactured ice will ever supersede this source of supply." Either the writer must have been inspired by some party or parties directly interested in the Norway ice trade, or else he shuts his eyes to the signs of the times. Elsewhere in the article the writer states that manufactured ice is not likely to replace natural ice because "the latter is the cheaper of the two. Moreover, if a block of natural ice and a block of manufactured ice were exposed under the same conditions to our atmosphere, the former would melt more slowly, and some portion of it would remain after the latter had become transformed into water. The natural ice is also much more beautiful, clear and sparkling, whereas the other is dull and heavy in color." This must prove interesting information to British ice manufacturers. John Bull is a great stickler for ancient customs, and he is but just beginning to learn the comfort and sanitary value of ice, but to judge by the way ice factories are flourishing it looks very much as if Norway natural ice, excellent though it is, and cheap, is doomed, and that in the not far distant future, so far as its trade in Britain is concerned.

THE German paper, *Milch Zeitung*, tells of a new cooling system combining the advantages of cooling from ice and direct from the refrigerator. The cooling medium is ice, and the cold conveyor, water. In this system the floor of the ice chamber is made like a series of roof shaped ridges, the edges of which are about ten inches apart. These run from side to side or from end to end of the chamber. Upon these ridges the cold water pipes are laid, and so connected that the water runs by gravity through the entire length of piping. The top of the ice chamber is so [illegible] that as the ice melts the increased space [illegible] not serve to accumulate or convey heat. [illegible] cheap, and no power is required [illegible] for a small pump to [illegible]ate the water as it runs out below, so it may repeat its round. It is claimed that the consumption of ice is less than by direct application, the air is kept pure, and the ice cold water may be tapped for use, if desired.

MISCELLANEOUS FOREIGN ITEMS.

——The municipal authorities of Leicester, England, who are building new public market buildings, have decided to provide same with cold storage facilities.

——The Linde Ice Machine Co., of Wiesbaden, Germany, is about to increase its capital, it is stated, from 4,000,000 to 5,000,000 marks, approximately from $1,000,000 to $1,125,000.

——The city authorities of Prague, Bohemia, are making preparations for the contemplated erection of a municipal ice manufacturing plant, to cost 100,000 florins (approximately $50,000).

——The city council of Lincoln, England, has adopted plans for the construction of chilling rooms and a refrigerator in connection with the public abattoir being erected near the cattle market.

——Mr. William Warner, of Bautry, is having erected at Cork, Ireland, a new creamery at the Albert quay, which is to have in connection cold storage chambers with 30,000 cubic feet of storage space. A refrigerating machine on the CO_2 system will be installed.

——The directors of the East Anglican Ice Co., Lowestoft, England, at their recent annual meeting decided to increase the capacity of the plant, which is now fifty tons ice making per day, and a proposition to double this capacity was taken under consideration.

——The Philippines Cold Stores, Ltd., was organized at London, England, January 8, 1900, with a share capital of £30,000 ($150,000), to carry on in the Philippine islands or elsewhere the business of refrigerators, cold store keepers, ice manufacturers, produce and provision merchants, etc. The first directors are: J. H. Scott, H. A. McPherson and G. S. Yuill.

——Large importers like Mr. James Ruddin, of Liverpool, England, affirm that rabbits which have come to England frozen keep fresh considerably longer, after being taken out of the steamer's refrigerator or the cold store, than newly killed rabbits. A well frozen rabbit, it is said, will keep fresh and good for nearly a week after being taken out of the freezing temperature. A freshly killed one will not keep sweet and good much more than half of that time. The point is an important one, and tells in favor of the frozen rabbit as an article of trade.—*Ice and Cold Storage.*

——The severe frost, says the *Meat Trades Journal*, has started a novel industry in Norfolk, where an ice harvest is now being gathered. Barges recently arrived at Yarmouth with cargoes of ice from half an inch to an inch thick collected on the South Walsham Broad and the upper reaches of the river. This ice, known in the trade as pancake ice on account of its thinness, realizes several shillings per ton, and was sold to local trawlers, who will use it as a cheap substitute for Norway ice. A barge crew of three men can gather from ten to twenty tons of pancake ice in a day.

——The artificial production of cold has reached its greatest development in Munich, where refrigeration by the passage of gases from high to low pressure was begun in 1881, and has since found so many applications that the industry has become second only to that of brewing. In the cold air storage building, the most complete yet erected, the temperature of the cells is kept at 3° C. (37.4° F.), the air containing 60 to 70 per cent of moisture. These are the chief industrial and scientific uses of the low temperatures: Manufacture of ice in the brewing industry; preservation of meat and other food; preservation of anatomical specimens; in the morgues; arrestation of the development of the silk cocoon; arrestation of the growth of bulbs, making them independent of their customary flowering season; in the preparation of explosives; in the preparation of mixtures rich in oxygen; in the manufacture of ozone; [illegible] testing of meteorological instruments; and in scientific research generally.—*Invention.*

——

The following improvements in ice or cooling plants recently made or now being made are reported by the Fred W. Wolf Co., ice and refrigerating machine manufacturers, Chicago: Pacific American Fisheries Co., Seattle, Wash., [illegible] new refrigerating coils; Swift & Co., packers, Chicago, [illegible] expansion piping; Crookston City Brewing Co., [illegible] expansion piping; Peter Hand Brewing Co., Chicago, 7[illegible] ammonia condenser; John B. Adt, Baltimore, Md., [illegible] condenser; New South Brewing and Ice Co., [illegible], Ky., [illegible] condenser; [illegible] Brewing Association, Marion, Ind., [illegible] expansion [illegible]; Armour & Co., South Omaha, Neb., 25-ton ammonia condenser; C[illegible] Brewing Co., Detroit, Mich., altering [illegible] refrigerating machine from a 12-ton to a 15-ton daily capacity.

THE following memoranda of projected ice factories and refrigerating plants, or of those in course of construction, and of improvements and betterments in existing plants, have come to our notice during the past month:

ALASKA.

Juneau.—Matlock & Fischer, brewers, are preparing to enlarge and improve their brewing plant, and put in a machine for the manufacture of ice.

ARIZONA

Phoenix. Alfred Kinney is remodeling his ice and soda water plant, and will put in a new 12-ton refrigerating machine, contract for which has been awarded.

ARKANSAS.

Clarendon. The Clarendon Electric Light and Ice Co. has been organized, with $10,000 capital. It is proposed to begin at once the erection of a plant for the manufacture of ice. J. S. Thomas is president of the company; M. J. Manning, vice-president, I. Bondi, secretary and treasurer.

CALIFORNIA.

Los Angeles. The Los Angeles Brewing Co. is preparing to cool its product by means of a 50-ton Linde refrigerating machine, to be supplied by the Fred W. Wolf Co., of Chicago.

CANADA.

Kingston. The Kingston Board of Trade has made arrangements to secure one of the Ontario government aided cold storage plants. The new plant is to cost $25,000 and be under the management of the Canadian Dairy School, Prof. J. E. Ruddick, superintendent.

Vancouver, B. C.—J. Woodward, manager of the Hygienic Creamery Co., of this city, has had plans prepared for an addition, to include cold storage rooms and a refrigerating plant.

CONNECTICUT.

New Haven. Lee & Hoyt, cold storage warehousemen, have recently equipped their warehouse with an Allen ice machine.

South Norwalk. Plans have been matured for the organization of a company with $50,000 capital, to erect and operate a plant for the manufacture of ice. Richard H. Golden is at the head of the enterprise. A 20-ton plant is to be put in.

DISTRICT OF COLUMBIA.

Washington. The American Security and Trust Co. are preparing to increase their cold storage capacity, and have contracted with the Frick Co., of Waynesboro, Pa., for a 20-ton refrigerating machine, complete.

FLORIDA.

Live Oak.—The Live Oak Manufacturing Co., manufacturers of lumber and ice, are about to enlarge their ice plant, and have contracted with the Fred W. Wolf Co., of Chicago, for a 2[illegible]-ton Linde refrigerating and ice making plant complete.

Tampa. The Cudahy Packing Co., of Kansas City, Omaha, and Sioux City, Iowa, are about to erect a cold storage warehouse here near by the plants now being erected by Swift & Co. and the Armours.

GEORGIA.

Dublin. The Dublin Oil Mill and Ice Co. is preparing to enlarge its ice making capacity, and is securing bids on increasing its [illegible] to a 10-ton plant.

HAWAII

Honolulu. The H[illegible] Brewing and Malting Co. is having plans prepared for a building to house an ice making plant of [illegible] capacity.

ILLINOIS.

Chicago. A. Booth & Co., fish merchants, are negotiating [illegible] erect a cold storage warehouse [illegible] $[illegible]

[illegible] W. J. [illegible] J. H. Herr[illegible]

[illegible]

INDIANA

Indianapolis. [illegible]

Mishawaka.—R. H. August, of Goschen, Ind., is preparing to erect an ice making and cold storage plant here.

INDIAN TERRITORY.

Sulphur.—The Sulphur Ice, Light and Water Co., whose organization and proposed improvement were mentioned in the January issue of ICE AND REFRIGERATION, has contracted with the Fred W. Wolf Co., of Chicago, for a 6-ton ice making plant, complete.

IOWA.

Sioux City.—The Sioux City Brewing Co. has decided to improve its brewery by the installation of a 50-ton refrigerating machine and plant, complete, contract for which has been awarded to the Fred W. Wolf Co., of Chicago.

KANSAS.

Atchison.—The Thomas Fuel and Ice Co. are making preparations to double the present capacity (twenty tons) of the ice making plant, and desire estimates on a 15 or 20-ton compressor.

KENTUCKY.

Henderson.—Citizens of this city are agitating for an ice making plant or an ice and coal plant combined.

Paducah.—Charles Smith has decided to add to his meat market a cold storage and ice making plant.

Winchester.—The Martin Construction Co., owners of the electric lighting plant, have decided, it is stated, to enlarge their works, and also add, in the near future, a 25-ton ice making plant.

LOUISIANA.

New Orleans.—The Security Brewing Co. is preparing to equip its brewing plant with a 70-ton refrigerating machine, contract for which has been made with the Frick Co., of Waynesboro, Pa.

New Orleans.—The Independent Ice and Distilled Water Manufacturing Co. are preparing to enlarge their plant by the addition of a 75-ton ice machine, absorption system. Work on the improvement is to begin about February 1, 1900.

MARYLAND.

Baltimore.—The Independent Ice Co., who erected a [illegible] ice making plant about one year ago, are enlarging their factory and have already contracted with the York Manufacturing Co., of York, Pa., who supplied the former machine, for an additional 100-ton ice making machine and a 75-ton freezing system.

Baltimore. The Carroll Ice Manufacturing Co. is extending its plant to provide cold storage facilities. Contract for a 50-ton refrigerating machine has been awarded to the York Manufacturing Co., of York, Pa.

MASSACHUSETTS.

Boston. The Essex hotel is about to improve its equipment by the installation of a 12-ton refrigerating plant, supplied by Westinghouse, Church, Kerr & Co., of New York.

North Adams. A new company has been organized here to build and operate an ice making and cold storage plant. Plans for a building eighty feet square, two stories high, to house a 35-ton ice plant and provide 25,000 cubic feet of cold storage space, have been completed. Contract for the machinery has been awarded to the Carbondale Machine Co., Carbondale, Pa. The plant is to be ready for operation in April, 1900.

Worcester. A company is being organized by local capitalists, whose purpose is to erect and operate a 25-ton can ice making plant. Wm. Hart, of the Board of Trade, is interested.

MEXICO.

La Colorado, Sonora.—George Wilcox is at the head of a company which will erect in the near future an electric light plant and ice factory, to supply the two towns of La Colorado and Minas Prietas.

Ures, Sonora. Francisco E. Morales has just completed an ice making and electric lighting plant to supply this city and vicinity.

MICHIGAN.

Detroit. The Northern Michigan Transportation Co. are preparing to build new docks, waiting rooms and cold storage warehouse. Architect Frank Friedrich is making the plans.

Detroit. West & Co., it is stated, are preparing to build a structure 200 x 200 feet, six stories high, to be equipped and used as a cold storage warehouse.

Grand Rapids.—The Morton house, in this city, is to be equipped with a 12-ton refrigerating and ice making plant, contract for which has been awarded to Kroeschell Bros. Ice Machine Co., of Chicago.

MINNESOTA.

Albert Lea. E. P. Stacy & Sons, of Minneapolis, are preparing to erect a cold storage warehouse especially designed for storing fruit.

Minneapolis. The Merchants' Cold Storage Co., of which L. B. K[illegible] is president and A. D. [illegible] general manager, are having remodeled an old building, at 304 and 306 Third avenue north, into a modern cold storage warehouse. When completed, April 1, 1900, the building is to have about 11[illegible] cubic feet of cold storage space.

TEXAS.

Fulshear. H. E. Thompson contemplates the erection of a [illegible] ton ice making plant, and asks for estimates on machinery.

Galveston. The Red Snapper Fishing Co., whose extensive improvement was noted in the January issue of ICE AND REFRIGERATION, has contracted with the Triumph Ice Machine Co., of Cincinnati, Ohio, for a 20-ton ice making plant and a [illegible] refrigerating machine for the fish storage rooms.

Houston. The Houston Ice and Brewing Co., of this city, has decided to make a number of extensive improvements in the Magnolia brewery, including new ice making and refrigerating machinery. The contract has been awarded to the York Manufacturing Co., of York, Pa., for a 250-ton refrigerating machine and a 100-ton ice making plant. The plant is to embody all the latest improvements. The machine will be fitted with a cross compound condensing engine. This will be one of the largest plants ever erected in the south.

Houston. It is reported that a company, known as the Crystal Ice and Fuel Co., is about to build a 75-ton ice making plant on McKee street in the fifth ward.

Paris. A company has been organized by Charles Noyes and others, with a capital of $20,000, to erect and operate an ice making plant.

Sherman. The Sherman Ice Co. has begun the erection of a new brick machine house 30x50 feet in size and a cold storage house 24x50 feet in size. A 15-ton ice making plant and a 50-ton refrigerating machine are to be installed by the Ruemmeli & Siebert Refrigerating Machine Co., of St. Louis, Mo. The improved plant is to be ready for operation in May next.

Smithville. G. Buescher's Sons, formerly of Moulton, Tex., will erect an ice factory and electric lighting plant at this place in the near future.

Temple. The Temple Cold Storage and Ice Factory, whose proposed improvement was mentioned in ICE AND REFRIGERATION for December, 1899, have contracted with the Ruemmeli & Siebert Refrigerating Machine Co., of St. Louis, Mo., for one 75-ton refrigerating machine, one 25-ton ice making plant and one 25-ton refrigerating machine.

VIRGINIA.

Alexandria. The Mutual Ice Co. is making preparations to enlarge its ice making plant.

La Crosse. W. H. Scott requests correspondence from makers of ice and refrigerating machines.

Newport News. The Consumers' Light, Heat and Ice Co. has been organized here by local capitalists.

Roanoke. The Virginia Brewing Co., whose proposed improvement was mentioned in the December 1899 issue of ICE AND REFRIGERATION, has contracted with the York Manufacturing Co. of York, Pa., for a 7-ton ice making and refrigerating plant, which is now being installed.

Winchester. A company is being formed here which proposes to erect and operate an ice making and cold storage plant.

WEST VIRGINIA.

Charleston. The Southern Manufacturing and Construction Co. desires estimates on a 10-ton ice making plant, complete.

WASHINGTON.

Everett. The Washington Brewing Co. has erected a new brewery here and equipped it with a [illegible]-ton refrigerating machine, built by H. E. Harris, of Oregon City, Ore.

Seattle. Armour & Co., of Chicago, have purchased a site on which they will erect a large meat supply depot and cold storage plant.

Seattle. The Frye-Bruhn Co., meat packers, whose plant was burned in September last, are rebuilding and will equip the new works with a [illegible]-ton refrigerating machine, contract for which has been awarded.

Whatcom. [illegible] Bros., of Laverne, Minn., are making preparations to erect an ice making and cold storage plant. Work on the building [illegible] February 1. A 7-ton refrigerating machine [illegible] will be installed.

WISCONSIN

La Crosse. Messrs. [illegible] petitioned the [illegible]

Waukesha. An [illegible]

Wausau. The K[illegible] Cold Storage [illegible] Dealers [illegible]

[illegible]

COMPANY ELECTIONS.

——The Kansas Ice and Storage Co., Salina, Kan., has elected James A. Kimball secretary to succeed W. E. Whittaker, who left Salina in December last without notice.

——The Toledo Ice Co., Toledo, Ohio, has elected officers as follows: Geo. W. Thomas, president; J. A. Miller, vice president; W. H. Bennett, secretary and treasurer, and O. C. Wedeman, general manager.

——The People's Hygienic Ice Manufacturing Co., of Brooklyn, N. Y., has elected the following officers for the ensuing year: President, Franz A. Schmitt; vice-president, Frederick Klie; treasurer, Jacob Fels; secretary, James Lever.

——The Eaton (Ohio) Electric Light, Power and Ice Manufacturing Co. has elected officers as follows: J. S. Berner, president; B. D. Moses, vice-president; W. C. Dave, secretary; E. S. Statler, treasurer; H. C. Aydelatt, manager.

——Stockholders of the Crystal Ice Co., Columbus, O., have re-elected their officers as follows: L. D. Hagerty, president; Chas. Wheeler, vice-president; John T. Barlow, treasurer; William Bott, secretary, and C. M. Kinnard, manager.

——The Alexandria Ice and Cold Storage Co., Alexandria, La., has elected the following officers: A. Ruemmeli, president; G. W. Bolton, vice-president; J. W. Bolton, secretary and treasurer. These, with A. Nicoud and W. J. Lemp, form the board of directors.

——The Tennessee Ice and Cold Storage Co., Jackson, Tenn., has elected new officers as follows: President, R. M. Hammer; vice-president, J. B. Schorr; secretary and manager, John Temple. These, with G. D. Raine and J. L. Wisdom, form the board of directors.

——The Greenville Ice and Coal Co., Greenville, Miss., has elected the following officers for the ensuing year: A. B[illegible], president; Adolphus Busch of the Anheuser-Busch Brewing Association, St. Louis, Mo., vice-president; W. Isenberg, treasurer; C. E. Livingston, secretary and treasurer.

——The Crystal Ice and Cold Storage Co., Bridgeton, N. J., has elected following officers: S. P. Fithian, president; J. Ogden, vice-president; S. H. Ogden, secretary and treasurer. These, together with J. A. Woodruff, J. G. Streets, J. R. Hoagland, R. G. and Enos Laning, form the board of directors.

——The Springfield Ice and Refrigerating Co., Springfield, Mo., has elected the following officers: Adolphus Busch, president; E. A. Faust, vice-president; C. Kruchman, secretary and treasurer; B. E. Meyer, manager. These, together with A. Nicoud, S. H. and Wm. H. Horine, form the board of directors.

——The Cumberland Ice Manufacturing Co., Cumberland, Md., has elected the following directors: George Schwarzenbach, Governor Lloyd Lowndes, David Walker, Charles C. Hedges, James Kirk and F. A. Blaul. Geo. Schwarzenbach was elected president, Governor Lowndes, secretary, and David Walker, treasurer and manager.

——The Jefferson Ice Co., of Philadelphia, held its annual election recently, and re-elected as directors John S. Worthington, Wm. Rodenhausen, Harry Rodenhausen, W. M. Murphy, J. R. Livezey, J. E. Bircher, W. P. Cox, H. F. M[illegible], J. Billerbeck, D. W. Fagley and L. W. Hauser. The company reports having had a very prosperous year.

——The Mineral Springs Ice Co., South Bethlehem, Pa., have recently elected the following new directors: George W. Rhoad, H. R. Knecht, A. N. Cleaver, A. H. Rauch, J. A. Eberts, M. K. Musselman, H. D. Heller, James Verden, of Dover, Del. These elected G. W. Rhoad, president; H. R. Knecht, vice-president; W. J. Semple, secretary and treasurer.

——The Marion Ice and Cold Storage Co., Marion, O., have recently elected the following officers: F. S. Keller, president and treasurer; H. W. Culbertson, vice-president; C. H. Elliott, secretary; H. W. Keller, superintendent. The proposition to increase the capital stock in order to provide funds for the erection of an ice making and cold storage plant was deferred for further investigation.

——The Consumers Ice Co., Scranton, Pa., have recently elected the following officers for the ensuing year: President, I. F. Megargel; vice president, William Connell; treasurer, A. D. Blackinton; secretary, John A. Schadt, general manager, Charles H. Schadt; directors, William Connell, I. F. Megargel, C. D. Jones, Robert Reeves, A. D. Blackinton, Reese G. Brooks, J. H. Steele, F. E. Schwartz and P. J. Horan.

OBITUARY.

Edmund Diemer, superintendent of the Lake Erie Ice Co., Cleveland, O., died at his home in that city on Saturday, January [illegible]. He was a son of the man who organized the Lake Erie Ice Co., and later became the president of that company, continuing as such until the company was merged, with others, into the Cleveland Ice Co., when he was made superintendent of the plant. He was forty-five years of age at the time of his death, and leaves a widow and three children.

The Anheuser-Busch Brewing Association of St. Louis, Mo., has purchased a large interest in the Greenville Ice and Coal Co., of Greenville, Miss.

ICY ITEMS.

Muscatine, Iowa, citizens are agitating for a cold storage and ice making plant.

— Citizens of Abilene, Kan., are agitating for an ice making and cold storage plant which, it is claimed, is much needed there.

—— Messrs. Weisel & Co., sausage makers, Milwaukee, Wis., are having their 8-ton refrigerating plant enlarged to a 10-ton plant by the Kroeschell Bros. Ice Machine Co., of Chicago.

— The Queen City Electric Light Co., of Gadsden, Ala., which is building a 20-ton ice making plant, as mentioned in the January issue of ICE AND REFRIGERATION, to be completed by April 1, 1900, has changed its name to the Gadsden Light, Coal and Ice Co., John T. Weller, W. H. Weller and Charles S. Ward forming the company.

The Frick Co., of Waynesboro, Pa., have recently supplied ammonia condenser systems to the American Ice Manufacturing Co., of Brooklyn, N. Y., and to the Atlanta Machine Works, Atlanta, Ga.; also supplied direct ammonia expansion piping to the Hon. Frank Jones, Portsmouth, N. H., for refrigerating his bottling department.

The ice manufacturing and fish company, of Punta Gorda, Fla., of which E. B. Cornell is general manager, has begun the erection of buildings, one 28x78 feet, and one 20x100 feet, for housing its proposed big plant, mention of which was made under the heading of "New Plants" in the December issue of ICE AND REFRIGERATION.

—— Frank L. Strong, consulting engineer war department, United States, started, on the second ult., for Manila, Philippine islands, to take part, in his official capacity, in the erection of the large ice making and cold storage plant now being built at Manila for the United States government. The structure, when completed, will have a capacity for storing in cool chambers 1,200 tons of beef, 300 tons of mutton, 100 tons of vegetables, fifty tons of butter and fifty tons of canned goods. The ice making capacity is to be fifty tons daily.

WE append below the most important new patents relating to the ice, ice making, refrigerating, cold storage and kindred trades that have been issued from the patent office during the past month, reported expressly for ICE AND REFRIGERATION. All inquiries relative to patents or trade marks in the United States and foreign countries should be addressed to William S. Beaman, counsellor at law and solicitor of patents, 99 Cedar street, New York city.

GAS PUMP FOR REFRIGERATING MACHINES.

640,330. Norman Selfe, Sydney, New South Wales. Filed March 20, 1897. Serial No 628,521. Patented January 2, 1900. No model.

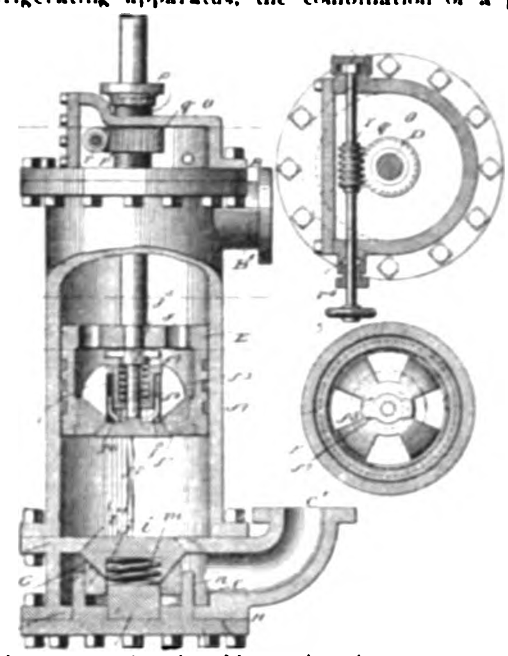
Claim. 1. In a machine of the character [illegible] the [illegible] with a bed plate of a steam engine [illegible] [illegible]

and in the same plane, and at points between the steam cylinder and the engine shaft, a rocking beam journaled at its middle on bearings placed below the center line of the engine, and having an arm extending downward at an angle to the beam, pistons in the compression cylinders, pitmen connecting the compression pistons respectively with the two ends of the beam, and a pitman connecting a crank on the engine shaft with the arm on the beam, substantially as described.

COMPRESSION PUMP FOR REFRIGERATING APPARATUS.

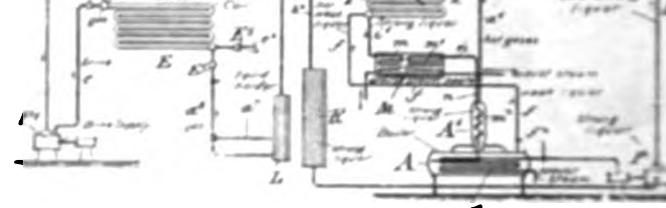
640,911. George B. Hiett, Atlanta, Ga., assignor of one-half to Samuel Louis Brewer, Tuskegee, Ala. Filed June 12, 1897. Serial No. 640,496. Patented January 9, 1900. No model.

Claim. —1. In a compression pump for ice making and refrigerating apparatus, the combination of a pump cylinder having suction and discharge ports and a valved outlet to said discharge port, a piston comprising a hollow piston head shell open at one end and provided with ports at its other end, a valve arranged to close against a seat on the open end of the shell, a spider above the valve seat, a removable cup independent of the valve seat and normally supported above the same and inclosed by said spider, a stem projecting through the cup, a spiral spring inclosed within the cup and encircling the stem, and a nut fitted on the free end of the stem and arranged so as to bear against and hold the same contained within said cup.



ABSORPTION REFRIGERATING MACHINE.

No. 638,491. Frank Allen, New York, N. Y., assignor to the Allen Ice Machine Co., same place. Filed July 29, 1899. Serial No. 725,451. Patented December 5, 1899. No model.



Claim. 1. The combination, with a generator, of a heating coil within the same, a pump for returning the strong ammonia water to the generator, a pipe connecting the heating coil of the generator with the exhaust port of one or more pump engines, a primary equalizing coil connected with the outlet port of said pumps and composed of an interior coil for the weak ammonia [illegible] and an outer coil for the strong ammonia water, a secondary equalizing coil, the outer coil of which is connected with the outer coil of the primary equalizing coil and the inner coil of which is connected with the generator to conduct off the weak ammonia water, an exhaust steam heater provided with exhaust steam, a coil in said exhaust steam heater connected with the outer pipe of the secondary equalizing coil, and a pipe connecting the coil in the exhaust steam heater with the generator for conducting the heated strong ammonia water back to the generator, substantially as set forth.

Second-Hand Retort Wanted

WANTED. Second-hand retort of approved make, complete with coils and [illegible] for [illegible] 15-ton ice plant. Address "RETORT," care ICE AND REFRIGERATION.

Ice Plant for Sale

FOR SALE. Five-ton ice plant, complete or in part, such as compressor 5-ton, [illegible] pipe, valves, manifolds, pumps, boiler, brine tank, etc. Address J. C. [illegible] & Co., Wamego, Kan.

Position Wanted as Engineer.

Position wanted as chief engineer by a man [illegible] experienced in building, erecting and operating absorption ice and refrigerating machinery. Address J. W. [illegible], [illegible] Twenty-second street, Birmingham, Ala.

Ice Machine for Sale.

A [illegible] absorption ice machine in good order will be sold at a bargain, it being replaced by a larger machine. For further particulars address "C. S. C.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Ice Cans for Sale.

FOR SALE. One hundred and eighty-five ice cans, 11 inches by 22 inches by 44 inches, No. 16 American galvanized iron. Used five months. Address "P. W. C.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Situation as Engineer.

An absorption machine engineer of eight years' experience. Can do repairing, etc. At present in charge of a 5-ton plant. Wants to change. Address "K. K. K.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Refrigerating Machine for Sale.

FOR SALE. A 15-ton vertical double-acting refrigerating machine, with horizontal slide valve engine. This machine is in good running order and as good as new, and can be bought cheap. For particulars, address H. H. PHILLIPS, [illegible] South Thirteenth street, St. Louis, Mo.

For Sale

We have a 6-ton Wimbler double-acting ice making 12-ton refrigerating machine, with Chandler & Taylor engine, [illegible] all in good order. Been used but little. Want to make room for larger machine. Will sell at a bargain, if taken soon. The [illegible] Ice Co., Lawrence, Kan.

Ice Plant for Sale.

FOR SALE. [illegible]-ton ice making plant, Hercules make, now in operation in good [illegible] town, in good running order. Will sell the plant complete with buildings and land or machinery and apparatus for removal. Address JOHN LAVOY, [illegible] Monadnock Building, Chicago.

Situation Wanted

WANTED. Situation by thoroughly first-class compression ice engineer. 2[illegible] years' experience; can give [illegible] [illegible] on short notice. Large plant preferred; will take stock or interest in good plant for half of salary. Address "COMPRESSION 2[illegible]," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

For Sale.

Patents covering ammonia compressor invented by the late Lieut. W. M. Wood, United States navy, comprising United States, Canadian, British, French, German and Belgian letters patent. Also United States letters patent covering the Hygeian refrigerator for household and other uses. J. HAMILTON, trustee in bankruptcy of the W. M. Wood Co., 47 Cedar street, New York.

Ice Machine for Sale

A 6-ton [illegible] ice machine, consisting of engine and pumps, ammonia and steam condensers, freezing coils and twenty-five ice cans. All in good condition. Will sell very cheap, as we have replaced same with larger machine and need the room that it occupies. Address THE GREENVILLE ICE AND COAL CO., Greenville, Miss.

Traveling Salesmen

WANTED. Traveling salesmen visiting breweries, ice factories, cold storage warehouses, etc., who are desirous of increasing their income by taking a side line of staple goods of [illegible] merit, for which there is a quick sale at refrigerating plants and requiring the carrying of no samples. Commission [illegible] per cent and [illegible] per cent. Address "FACTORY," P. O. Box [illegible], Covington, Ky.

Material for Refrigerating Plants

FOR SALE AT [illegible], MASS. Extra heavy 1 inch, 2 inch and [illegible] inch pipe. Coils of 2-inch extra heavy pipe, eight, ten and twelve pipes [illegible] [illegible] inches long [illegible] cents per foot [illegible] return bends [illegible] feet by 30 inches [illegible] feet long by 24 inches diameter [illegible] cooler. All in perfect condition and as good as new. [illegible] 1,500 pounds to inch. [illegible] Address L. H. HASKELL, Gloucester, Mass.

For Sale

One Harris-Corliss engine 12 [illegible] fly wheel [illegible] feet diameter, [illegible] face, [illegible] [illegible] [illegible] [illegible] safety valves, three [illegible] [illegible] [illegible] 1[illegible] ton ice plant [illegible] [illegible] [illegible] Raleigh, N. C. For particulars apply to HENRY HARRIS & SON, Charleston, S. C.

REDUCES OIL BILLS

Our Cross Oil Filter saves 50 % or more of your lubricating oil bills. Used in 24 countries. Specially adapted to ice and cold storage plants and breweries. Capacities 3 to 150 gallons per day. All sizes sent on approval. SEND FOR CATALOGUE 14.

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Our adjustable door frame restores a perfect fit, free as ever, in a minute, without taking off a shaving.

Doors and frames all fitted up complete and adjusted, ready to push in place, screw fast and use.

Made with sill, with beveled threshold and for cement or other flush floors. Also with trap for overhead track.

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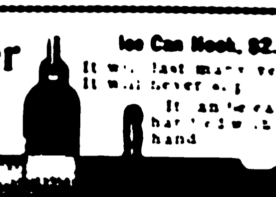

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It will never slip
It can be easily handled with one hand

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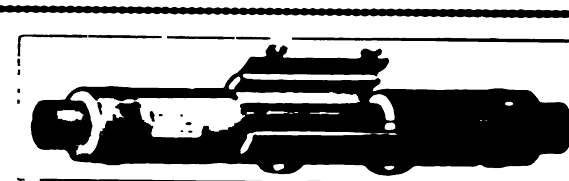

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Send for samples and quotations.

ROBERT A. KEASBEY, 83 WARREN STREET, NEW YORK, AND 13 TERRACE, BUFFALO, N. Y.

Second-Hand Retort Wanted

WANTED.—Second-hand retort of approved make, complete with coils and [illegible] for [illegible] 15-ton [illegible] plant. Address "RETORT," care ICE AND REFRIGERATION.

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FOR SALE.—Five-ton ice plant, complete or in part, such as compressor 5-ton, ice cans, [illegible], valves, manifolds, pumps, boiler, brine tank, etc. Address J. C. [illegible] & CO., Wamego, Kan.

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For Sale

We have a [illegible]-ton Winkler double-acting ice making 12-ton refrigerating machine, with Chandler & Taylor engine, 1[illegible]×14, all in good order. Been used but little. Want to make room for larger machine. Will sell at a bargain, if taken soon. The [illegible] ICE CO., Lawrence, Kan.

Ice Plant for Sale.

FOR SALE.—[illegible]-ton ice making plant, Hercules make, now in operation in good [illegible] town, in good running order. Will sell the plant complete with buildings and land or machinery and apparatus for removal. Address JOHN LEVEY, [illegible] Monadnock Building, Chicago.

Situation Wanted

WANTED.—Situation by [illegible] by first-class ice [illegible] engineer. 2[illegible] years' experience [illegible] [illegible] short notice [illegible] plant preferred, will take stock or interest in good plant for half of salary. Address "COMPRESSION 2[illegible]," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

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Material for Refrigerating Plants

FOR SALE AT [illegible], Mass.—Extra heavy 1-inch, 2-inch and [illegible] pipe [illegible] [illegible] extra heavy [illegible] [illegible] eight, ten and twelve [illegible] [illegible] [illegible] [illegible] inches long [illegible] cents per foot [illegible] [illegible] [illegible] [illegible] [illegible] feet by [illegible] inches [illegible] [illegible] [illegible] feet long by 24 inches diameter [illegible] [illegible] [illegible] [illegible] All in perfect [illegible] and as good as new. All tested 1,500 pounds to inch. Also one [illegible] [illegible]. Address L. H. [illegible], Gloucester, Mass.

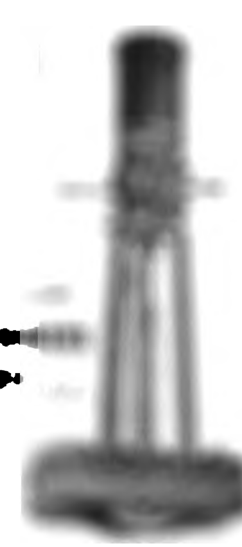
For Sale

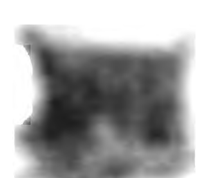
One Harris-Corliss engine 12 [illegible] [illegible] wheel [illegible] feet diameter, [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] ammonia [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Raleigh, N. C. For particulars apply HENRY [illegible] & SON, Charleston, S. C.

ICE CANS

Ice Making and Refrigerating Machinery

ICE CANS



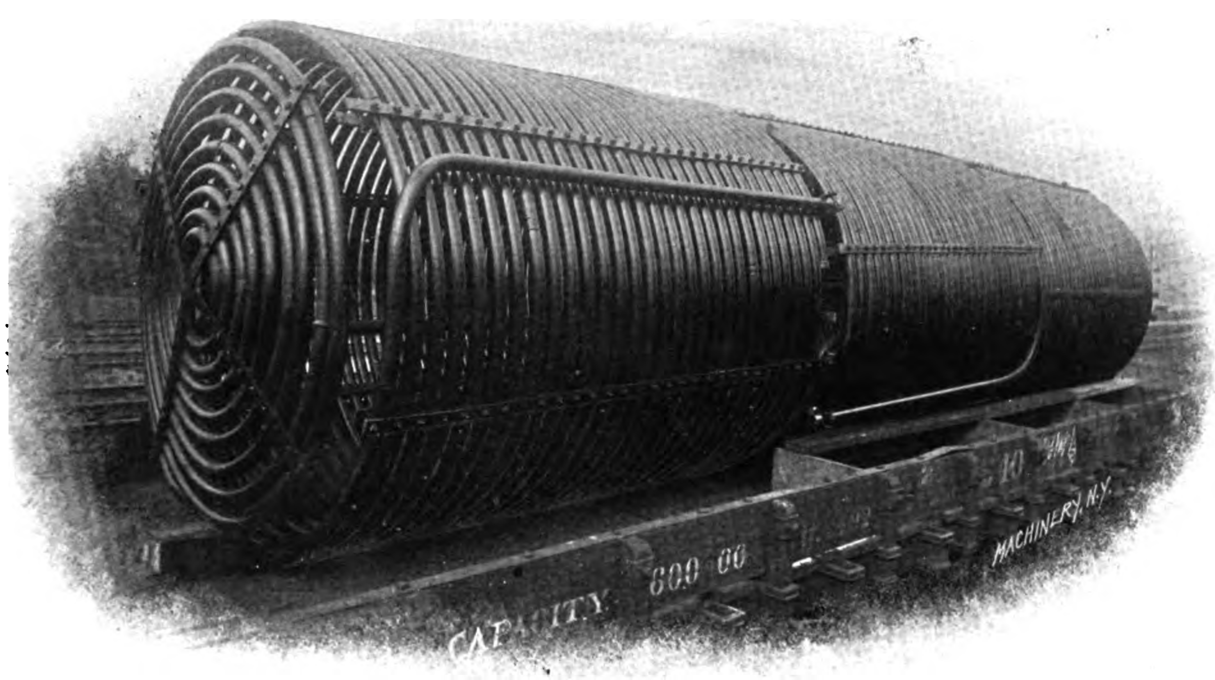


THE WHITLOCK COIL PIPE COMPANY

MANUFACTURERS OF

Wrought Iron Ammonia Coils

OF EVERY DESCRIPTION

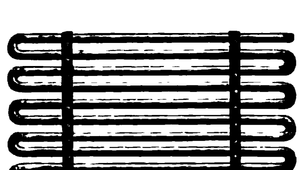


BENDS and MANIFOLDS

FOR ALL PURPOSES.

IRON, BRASS AND COPPER **COILS** OF ALL KINDS

FOR



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THE WHITLOCK COIL PIPE COMPANY

Main Office and Works, ELMWOOD, CONN.

Telegraph Address, HARTFORD.

IRON
COPPER
BRASS

COILS

Bends and
Manifolds

FOR
ALL
PURPOSES

Wrought Iron Ammonia Cocks

Ammonia Valves and

Fittings

Harrisburg Pipe

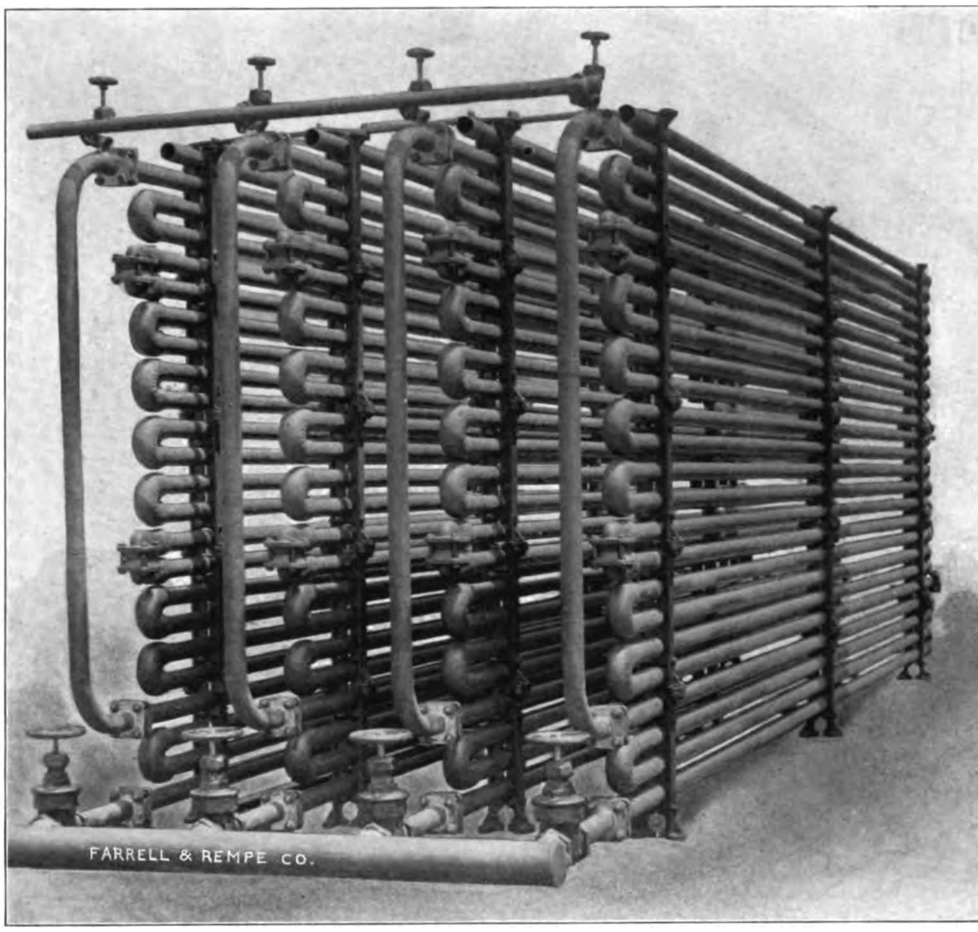
STILLS and
ABSORBERS

FOR ABSORPTION AMMONIA
ICE AND REFRIGERATING MACHINES

SPECIAL ATTENTION GIVEN TO REPAIRS FOR
EXISTING ICE MACHINES

FARRELL & REMPE Co.,

Corner Sacramento and Carroll Aves...CHICAGO



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COILS

IN ANY DESIRED CONTINUOUS LENGTH OR SHAPE,

FOR ICE and REFRIGERATING MACHINES.

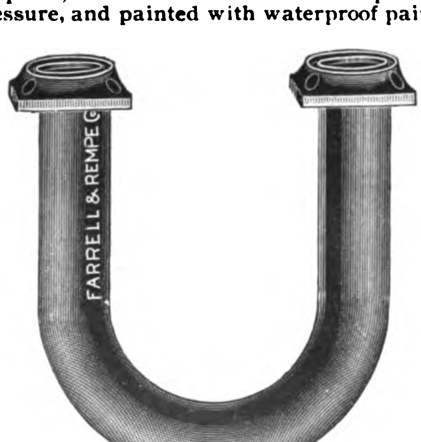
PIPE WELDING BY ELECTRICITY

COPPER and BRASS COILS,
AMMONIA RECEIVERS,
OIL INTERCEPTERS,
AMMONIA FITTINGS OF ALL KINDS,
RETURN BENDS AND MANIFOLDS.

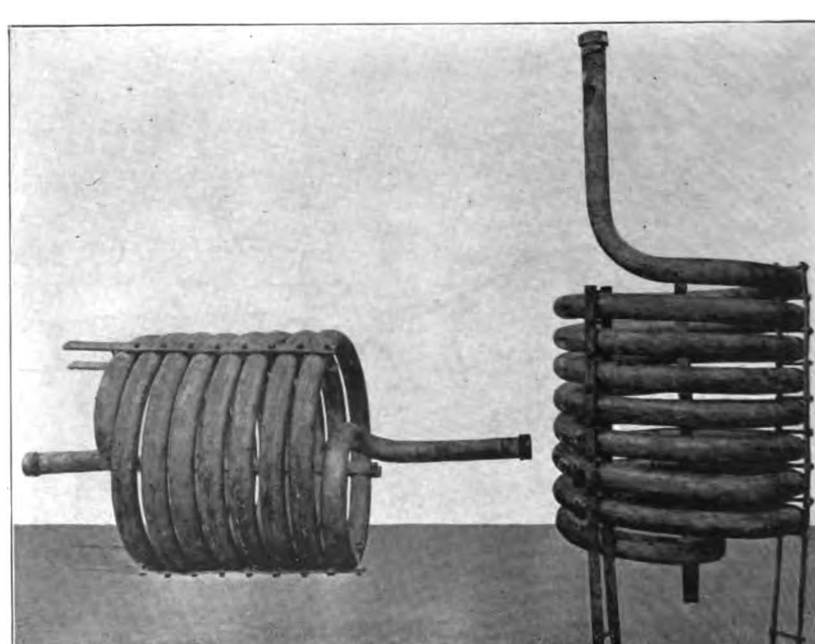
CONDENSERS OF ALL KINDS MADE TO ORDER...

Direct Expansion Pipe

with steel flanges soldered on, or connected with ammonia unions, as may be desired. This pipe is made especially for ammonia purposes, and tested under water to 500 pounds pressure, and painted with waterproof paint.



RETURN BENDS
With or without Flanges soldered on.



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PHILADELPHIA PIPE BENDING WORKS

C. BAILE.
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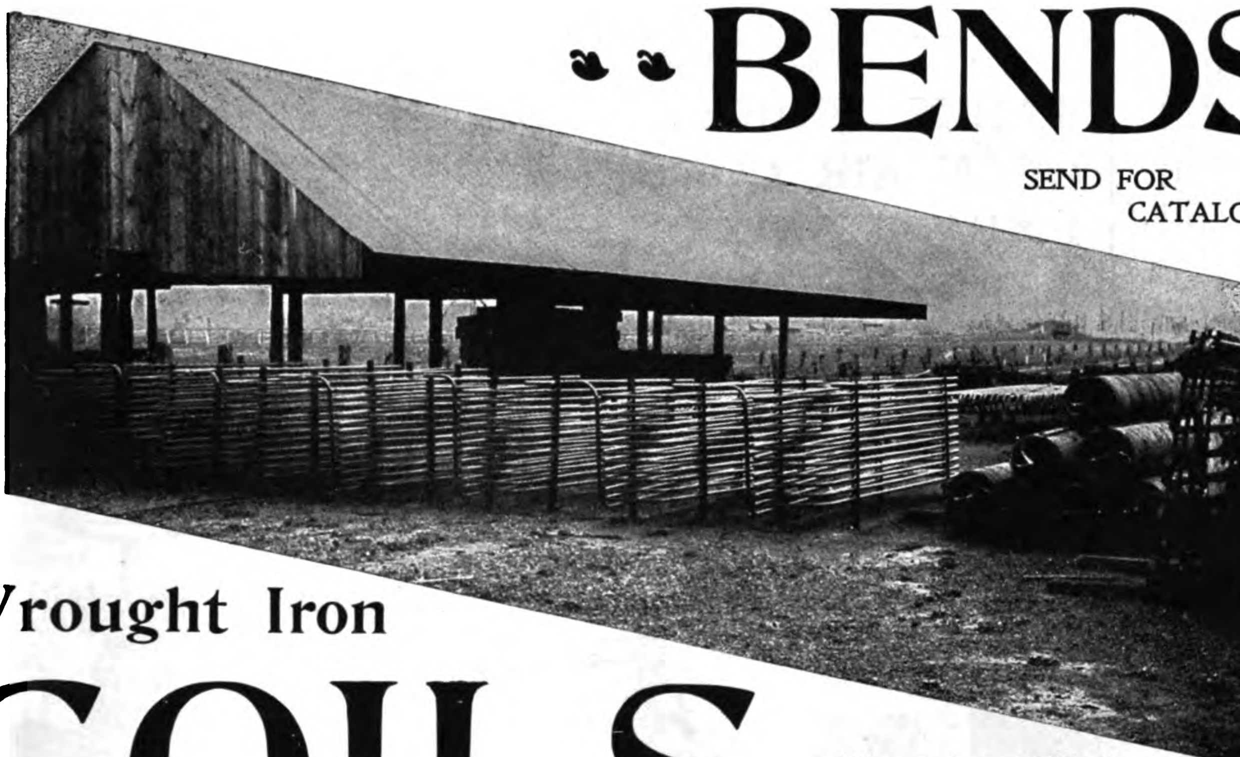
Office and Works: } Rising Sun Lane and N. P. R. R., PHILADELPHIA



BENDS

SEND FOR CATALOGUE

Wrought Iron

COILS

Address all Communications to

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Buildings and Grounds

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COLD STORAGE AND ICE MAKING PLANTS

Large Warehouses, fronting on tide water, ready for occupancy. Two and three-quarters miles water front, New York City.

Low Freights by Rail and Water

TO ALL PARTS OF THE WORLD.
RAILROAD AND TERMINAL STATIONS ON PROPERTY.

FOR INFORMATION AND TERMS APPLY TO OWNERS.

Brooklyn Wharf and Warehouse Co.

68 BROAD ST., NEW YORK.

CLEAR ICE

AND How to Obtain it

THE INTERNATIONAL FILTER IS INDISPENSABLE TO THE UP-TO-DATE ICE MANUFACTURERS.....

Connected with the Storage Tank, the water passing through the Filter into the freezing can is freed from all dust, rust, oil, etc. No device you may now be using for this purpose can take the place of our filter, whose object is to remove all foreign matter, which previously there was no way of arresting.

Easy to apply to any plant.
Simple to operate.
Requires little attention.
Occupies small space.

Also specially adapted for filtering distilled water for bottling purposes, insuring a perfectly brilliant water.

The Consumers Company.

CHICAGO, ILL., Sept 30, 1898.

INTERNATIONAL FILTER CO., 1702 Wabash Ave.

Gentlemen:—The eight International Filters we purchased of you have been in use at our Ice and Cold Storage Plant since last March, and at all times have given the best of satisfaction.

Before using your filters we had some difficulty in keeping our ice clean and free from dust and specks; but since we have adopted your machines in connection with our charcoal filters, etc., have had no trouble, our ice at all times showing up clean and free from any discoloration.

Yours truly, (Signed) C. B. FAIR,
Mechanical Supt. The Consumers Company

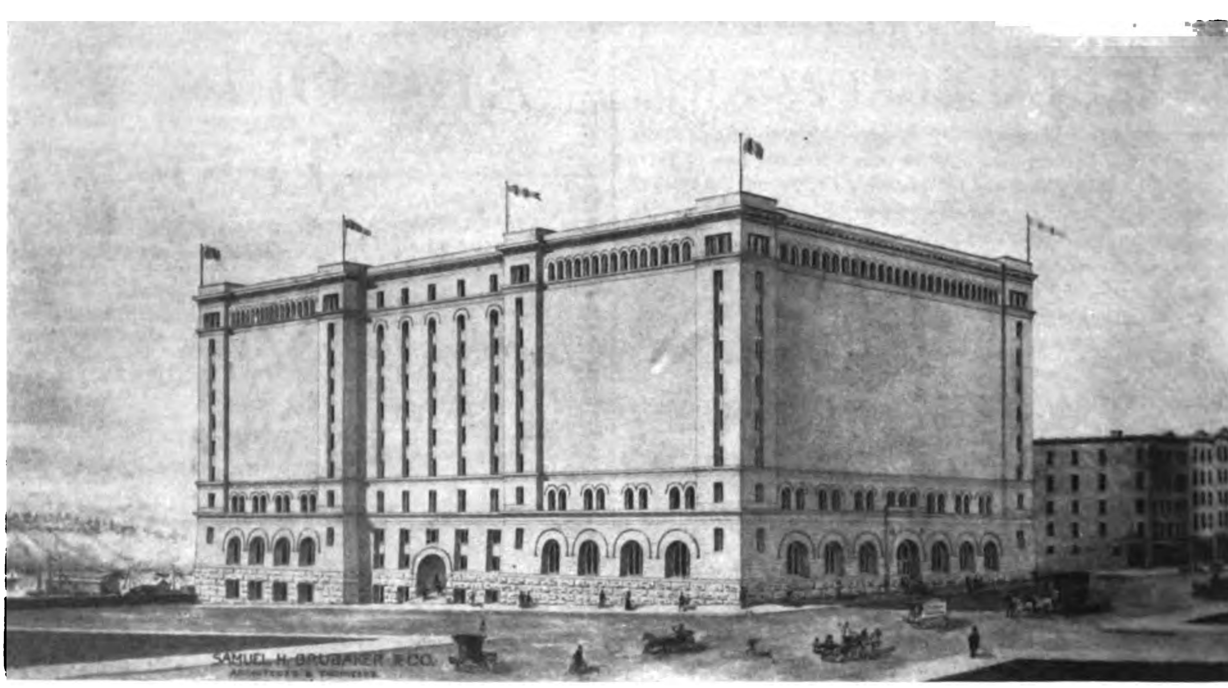
Send for Circular and Prices.

International Filter Co.

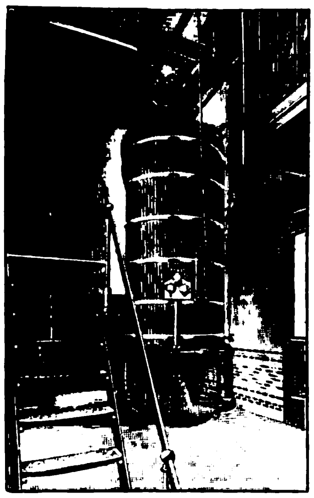
1702 Wabash Avenue, CHICAGO, ILL.


BOYLE UNION
AMMONIA HEADER
COUPLING
GLAND END RETURN BEND
OUR SPECIALTY
TANKS, BRINE CONDENSERS....
OPEN AIR CONDENSERS COMPOUND EFFECT
EXPANSION COILS BOTH FOR BRINE AND DIRECT GAS
VALVES AND FITTINGS FOR AMMONIA
CAST IRON BRINE BEND
WROUGHT IRON RETURN BEND
Allow us to remind you that this is the time to overhaul your machines for the coming season, and that we manufacture and carry in stock all parts of Ice Machinery (except engines and compressors) for immediate use.
AUTOMATIC AMMONIA GAUGE
NASON MANUFACTURING CO.
71 BEEKMAN STREET
SEND FOR OUR CIRCULAR.
NEW YORK CITY.
"SIDELUG"
NASON STEAM TRAP
ELBOW
BRINE COCK
TEE
GLOBE VALVE


JARECKI MANUFACTURING CO., ERIE, PA.
MANUFACTURERS OF MALLEABLE AND CAST IRON
AMMONIA, GAS, FITTINGS STEAM and WATER
BRASS AND IRON VALVES AND COCKS, STEAM AND HOT WATER RADIATORS.
SEND FOR CATALOGUE.
PIPE THREADING TOOLS.
ERIE PIPE HANGERS.
ELBOW.
RETURN BEND.
RETURN BEND.
FLANGE UNION
MALLEABLE FLANGE UNION
CAST IRON AMMONIA FITTINGS.
GLOBE VALVE.
AUTOMATIC STEAM FLUE CLEANER.
TEE.
TEE.
The Erie Union is extra heavy and provided with a soft copper packing ring, which is superior to all devices, and is held in position by being forced into a groove under pressure, which prevents the packing from falling out of place when the union is taken apart, and can be screwed and unscrewed indefinitely without the least injury to the packing, which is almost indestructible. The copper packing being soft enough to form a good tight joint, and also not as liable to injury by any hard substance getting between the packing and seat, as would be the case if softer metal packing is used.



DO YOU WANT?



COLDER BRINE
SAVE COAL
INCREASED CAPACITY

ALSO

AVOID

FREEZING BACK
AND LEAKY EXPANSION COILS.

THEN BUY A HENDRICK

BRINE COOLER: AMMONIA CONDENSER

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Ice and Refrigerating Machinery

STEAM ENGINES AND BOILERS
GENERAL MACHINERY
BRASS AND IRON CASTINGS
STEAM PUMPS, PIPE, VALVES
FITTINGS, BELTING, PULLEYS
HANGERS, SHAFTING, COUPLINGS, ETC.

Estimates Furnished for Complete Plants. Pipe Bending a Specialty.

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Architects . and . Engineers

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COLD STORAGES, ICE PLANTS
SKATING RINKS, HOTELS, CLUB HOUSES
APARTMENT HOUSES, ETC.

Contracts taken for Designing and Erecting, including Superintendence

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WARWICK MACHINE CO.

MANUFACTURERS OF

Ice & Refrigerating Machinery

Of a new and improved pattern; from ½ ton to 15 tons capacity ice making.
We can furnish references from parties who have had our machines in successful operation for ten years.
Write for estimates and prices to our home office

THE WARWICK MACHINE CO., Newport News, Va.

NOW READY...

INDICATING THE REFRIGERATING MACHINE....

BY
GARDNER T. VOORHEES

Simple, practical tables for applying the true compression curve to the indicator card.

So simple are these tables that any man competent to run a compressor can use them. It is as important for the owner of a compression machine to have these tables as it is to know whether he has a hole in his money pocket.

Full instruction for attaching the indicating apparatus, with numerous cuts of indicator cards, showing and explaining faulty running of the compressor. Also full descriptions, with cuts, of the standard makes of indicators, planimeters, reducing motions, etc., etc.; together with a practical treatise on the action of the compressor; with a full appendix of ammonia tables, etc., etc., and all data necessary to work up indicator cards from the ammonia compressor or steam engine.

PRICE { BOUND IN CLOTH, : $1.00
BOUND IN MOROCCO, 1.50 }

Sent to any address prepaid on receipt of price.

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Consulting and Contracting Engineer

For ICE MAKING and REFRIGERATING MACHINERY and PIPING.

AMMONIA PIPES, VALVES AND FITTINGS.

Old Plants overhauled and remodeled. All sorts of Repairing promptly attended to. Expert advice on new installations, or wherever a plant falls short of its usual capacity. Fifteen years' practical experience in the line of Ice Making and Refrigeration enables me to guarantee satisfaction in every instance. Your correspondence is respectfully solicited.

Corner Perry and Washington Sts., BUFFALO, N. Y.

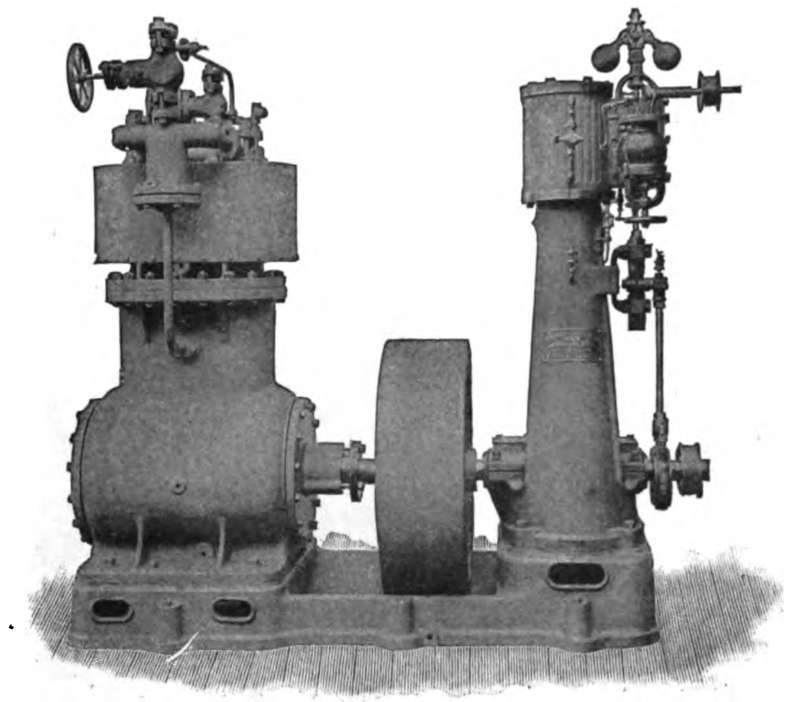
Refrigerating Machines

The Ideal

THE ARCTIC

REMINGTON

Ice Making and Refrigerating Machinery



REMINGTON DOUBLE CYLINDER ICE MACHINE

Complete Plants Erected and Guaranteed.
Ice Making by Can and Plate System.
Pure Ice Made from Sea Water.
Refrigeration by Brine Circulation and Direct Expansion Systems.

Ammonia Compressors..

Horizontal Double Acting, of Large Capacity, with Corliss and Slide Valve Engines.
Vertical Single Acting, of Small Capacity, with Engine Direct Connected, and with Fly Wheel Pulleys for Belt Power.

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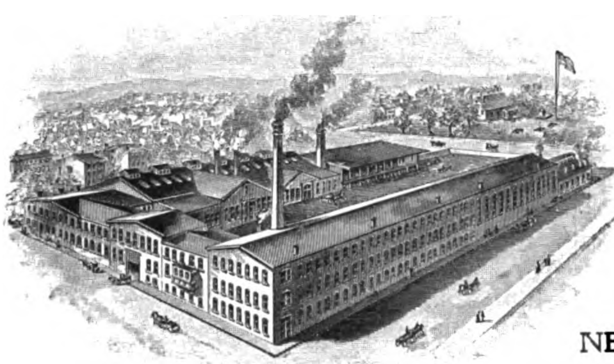
WILMINGTON, DEL., U. S. A.

W. R. NIFONG, SALES AGENT, 832 W. KING'S HIGHWAY, ST. LOUIS, MO.

EDGAR PENNEY, PRESIDENT AND MANAGER. ROBERT WHITEHILL, SEC. AND TREAS.
A. B. WHITNEY, VICE-PRESIDENT. GEO. B. SALISBURY, AUDITOR.



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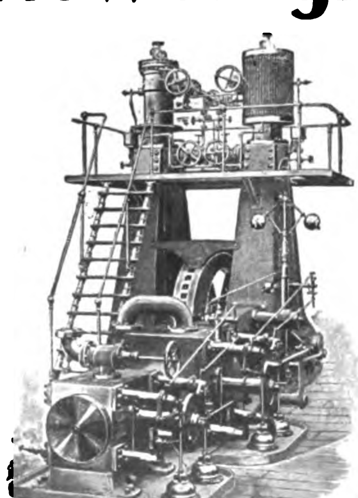
NEWBURGH, N. Y.

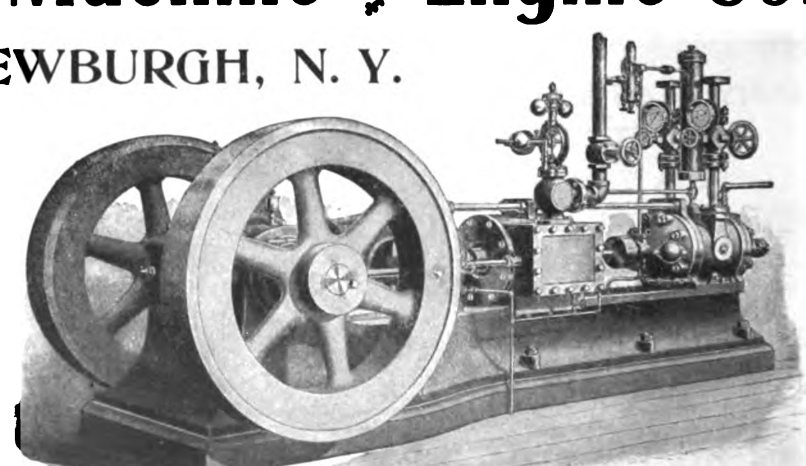
NEWBURGH-ICE-MACHINE AND ENGINE-CO. NEWBURGH, N.Y.
PENNEY'S-AMMONIA-ICE MACHINES · WHITEHILL-CORLISS ENGINES · OUR-NEW-PICTET-OXIDE SYSTEMS · STEAM POWER PLANTS

Newburgh Ice Machine and Engine Co.

NEWBURGH, N. Y.



Penney's Patent Vertical Single Acting Duplex Refrigerating Machine.



Penney's Perfected Horizontal Double Acting Ice Machine.

REFRIGERATING MACHINES

ICE MAKING AND REFRIGERATING

...BY THE...

Carbonic Anhydride System

Though but lately introduced into the United States, is widely used by the principal Ocean Steamship Companies and foreign governments for the exportation and preservation of fresh meats, fruits, etc., there being now in operation in all parts of the world over 1,000 of these machines.

Some of its Advantages...

ARE AS FOLLOWS:

It is the ONLY SYSTEM producing Ice or Refrigeration where a careless attendant cannot cause dangerous accidents.

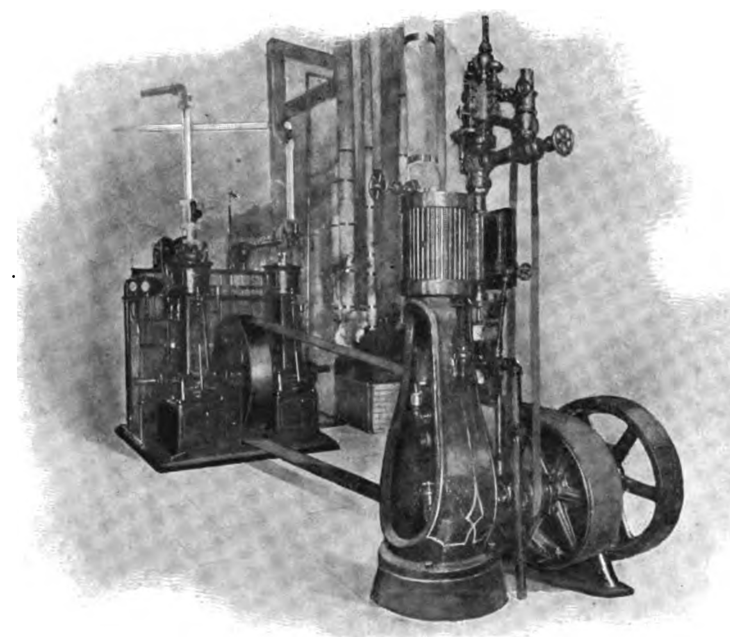
Carbonic Anhydride is the CHEAPEST GAS used for the purpose, being ONE-QUARTER the price of Anhydrous Ammonia.

It will produce any desirable low temperature required for freezing or storing food products.

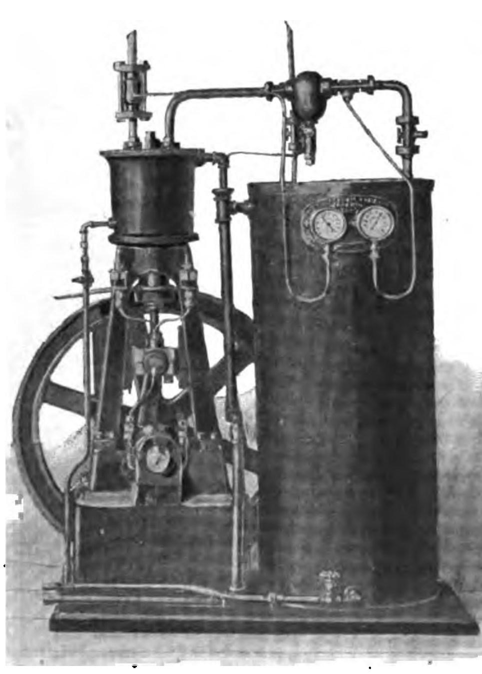
Carbonic Anhydride is a harmless Gas, having no deleterious effect on the human system. The whole charge of a plant can escape in a room without producing any bad effect on men at work therein.

Should a leak occur in a storage room, no damage will be done to either vegetables or meats that may come in contact with the gas, it being a preservative of both.

The fact that it does not attack any of the common metals makes it possible to secure a superior construction of the apparatus.



We Furnish and Install Complete Ice Making... ....or Refrigerating Plants



From 300 pounds to 20 tons Refrigerating Capacity per diem, for

HOTELS, CLUBS, COLD STORAGE WAREHOUSES,
BUTCHERS AND MEAT MARKETS,
HOSPITALS AND MORGUES, ICE CREAM FACTORIES,
SALOONS, FISH MARKETS, RESTAURANTS, STEAMSHIPS,
CAFES, CREAMERIES, BREWERIES, CANDY FACTORIES,
SODA WATER FOUNTAINS, CHOCOLATE WORKS,
PROVISION AND GROCERY STORES, ETC.

Or any other places where Ice or Refrigeration is required, or a low temperature is desired.

In Making Inquiries... Please Give Us the Following Information:

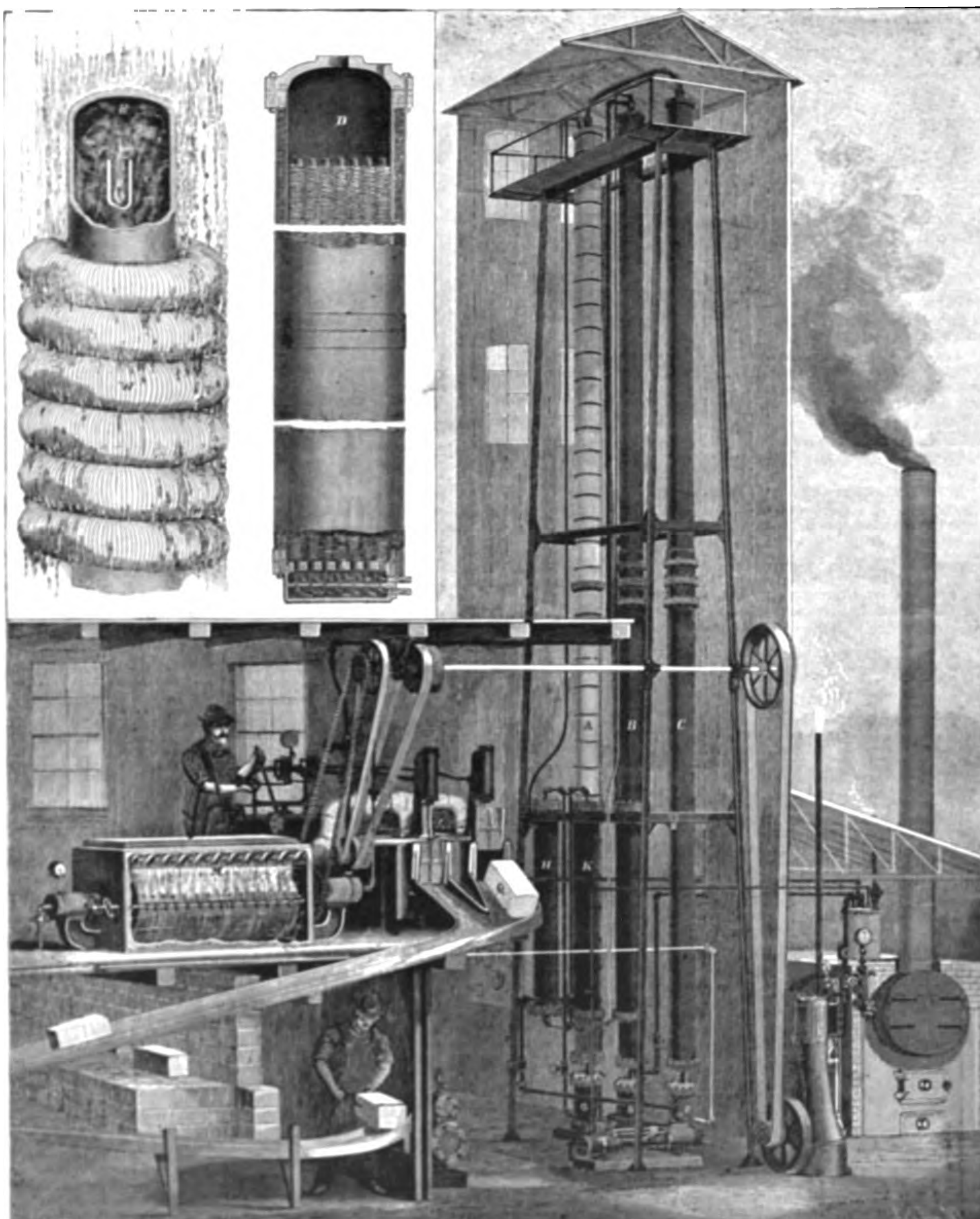
Whether the machine is to be driven by belt from power you already have, or whether we are to supply Steam, Gas or Gasoline Engine or Electric Motor. If for preserving Meats or Cold Storage, give size of rooms and amount likely to be put in daily. If for Ice Making, state quantity of ice. If for Cooling Water or any other liquid, state quantity per hour and from what to what temperature.

ESTIMATES and INFORMATION CHEERFULLY GIVEN.
CORRESPONDENCE SOLICITED.

THE COCHRAN COMPANY, ENGINEERS Lorain, Ohio, U. S. A.

The Regealed Ice Machine

MANUFACTURED SOLELY BY D. L. HOLDEN 1336 BEACH ST. PHILADELPHIA, PA.



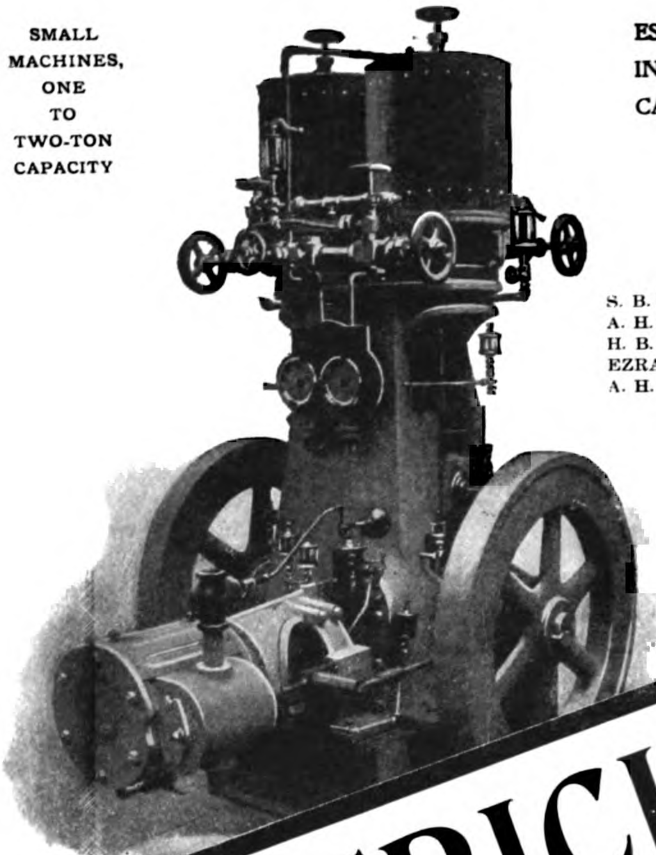
Makes Ice at 50 Cts. a Ton

THE FRUIT OF THIRTY-FIVE YEARS OF EXPERIENCE
AN ABSOLUTELY NEW WAY OF MANUFACTURING ICE
A COMBINATION OF THE COMPRESSION AND ABSORPTION AMMONIA SYSTEMS

D. L. HOLDEN, 1336 Beach St., PHILADELPHIA, PA.

SOLE MANUFACTURER OF THE REGEALED ICE MACIHNE

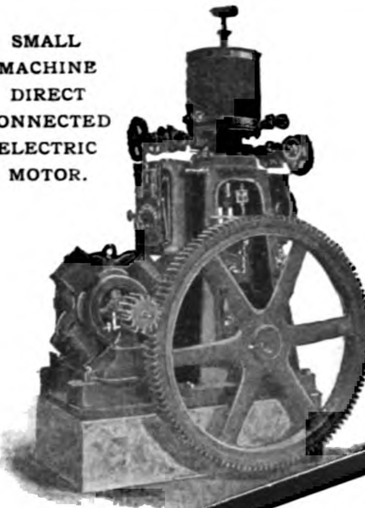
SMALL MACHINES, ONE TO TWO-TON CAPACITY



ESTABLISHED 1853.
INCORPORATED 1885.
CAPITAL, $1,000,000.

S. B. RINEHART, President.
A. H. STRICKLER, Vice-President.
H. B. STRICKLER, Treasurer.
EZRA FRICK, Gen'l Manager and Sec'y.
A. H. HUTCHINSON, Manager Ice and Refrigerating Dep't.

SMALL MACHINE DIRECT CONNECTED ELECTRIC MOTOR.



FRICK COMPANY

FRICK COMPANY ECLIPSE WAYNESBORO, PA.

ICE MAKING AND R

...WE... BUILD

ICE PLANTS—Can or Plate System. Special Machinery for Breweries, Hotels, Creameries, Skating Rinks.

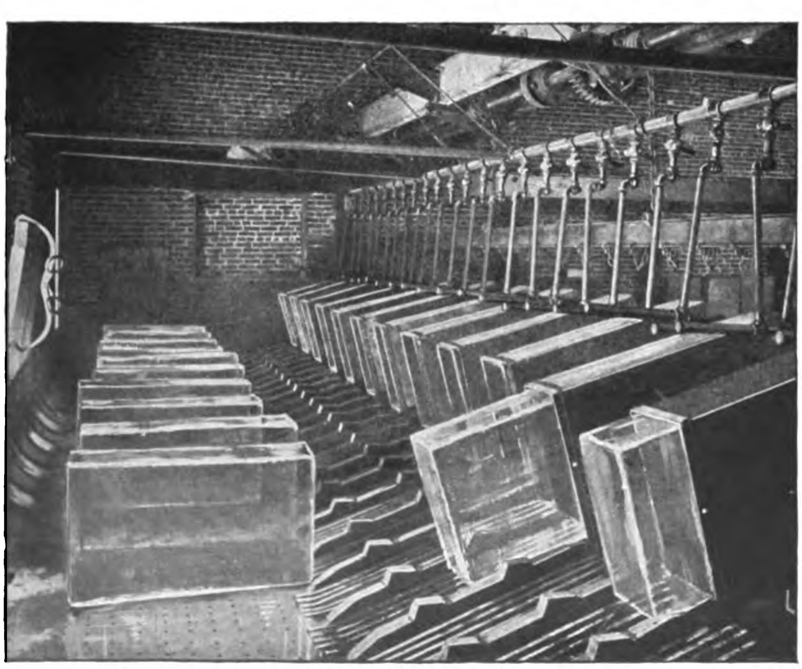
REFRIGERATING PLANTS—Direct or Brine System. For Cold Storage and Refrigeration in any of their branches.

CORLISS ENGINES—Condensing and Non-condensing. Single Cylinder and Double to Quadruple Compound. Forty to 3,000 H. P. For all manufacturing purposes.

AMMONIA VALVES, FLANGES and FITTINGS—of our improved design and best material, same as those supplied with our regular standard plants.

STEAM BOILER PLANTS and TANK WORK—Locomotive, Upright and Return Tubular Boilers. Special Tanks for all uses.

OUR FACILITIES for designing and manufacturing enables us to fill your order satisfactorily.

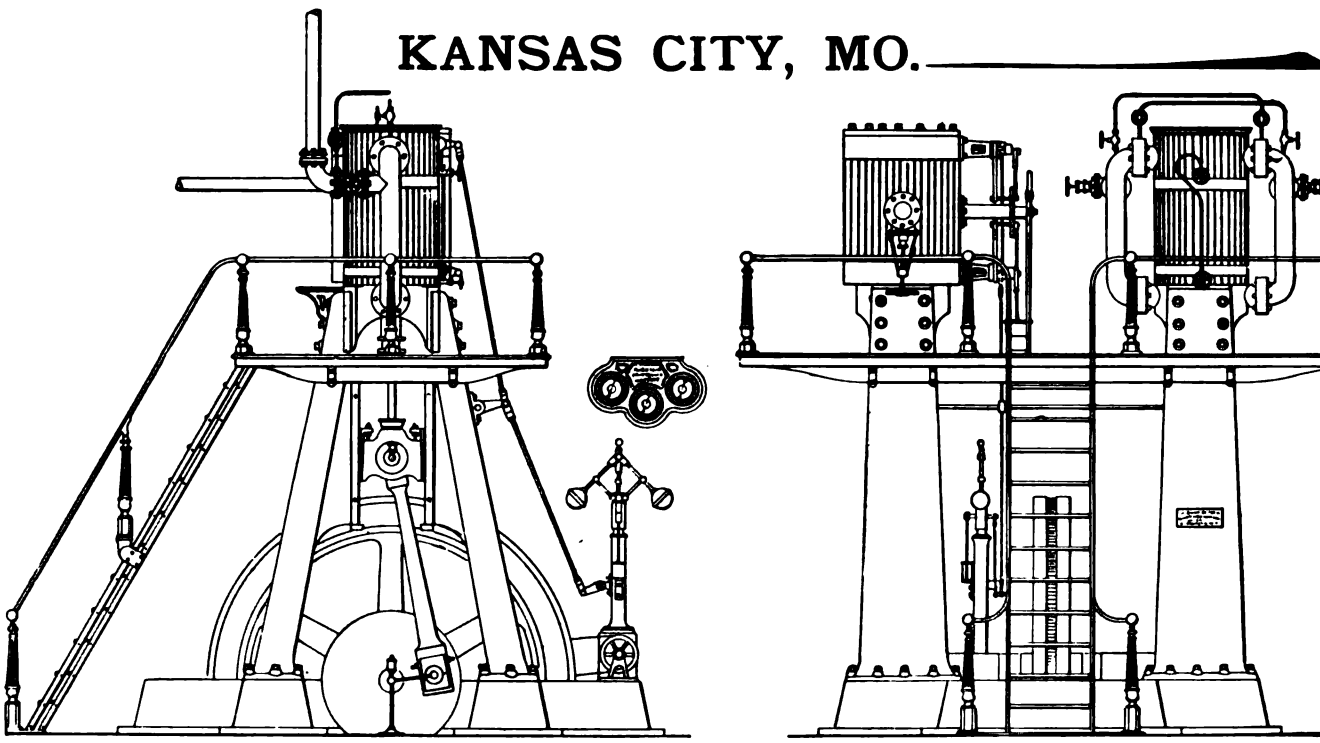


ICE DUMPING APPARATUS.

Engineers

THE RIVERSIDE IRON WORKS CO.

KANSAS CITY, MO.



100-TON REFRIGERATION MACHINE—SECTIONAL FRONT AND SIDE VIEWS.

MANUFACTURERS OF

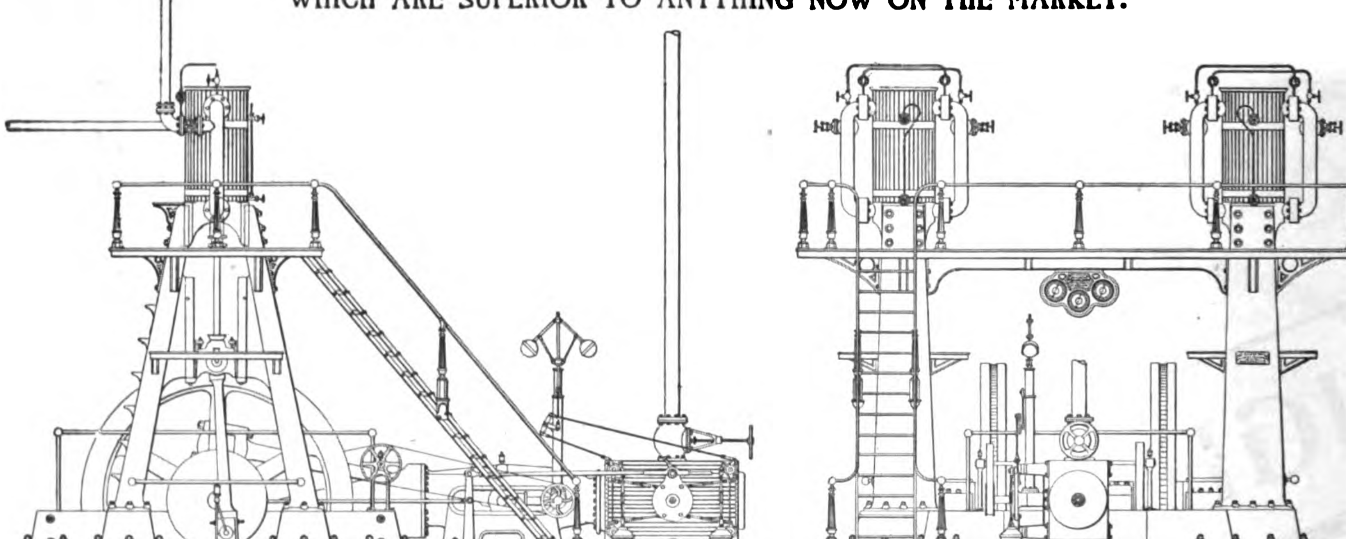
ICE AND REFRIGERATING MACHINERY

OF ANY SIZE OR CAPACITY, ON THE COMPRESSION PRINCIPLE

ALSO MANUFACTURERS OF

SPECIAL AMMONIA FITTINGS

WHICH ARE SUPERIOR TO ANYTHING NOW ON THE MARKET.



250-TON REFRIGERATION MACHINE—SECTIONAL FRONT AND SIDE VIEWS.

We contract for the EQUIPMENT OF COMPLETE PLANTS, either for Ice Making, Cold Storage, or Packing Houses or Breweries.

PARTIAL LIST OF MACHINES IN OPERATION:

St. Louis Ice and Cold Storage Co., St. Louis, Mo.	1	70-ton Ref.	Jacob Dold Packing Co., Buffalo, N. Y.	2	50-ton Ref.
Kansas City Ice and Cold Storage Co., Kansas City	1	70-ton "	Jacob Dold Packing Co., Kansas City, Mo.	1	70-ton "
Reid Bros. Packing Co., Kansas City, Kan.	2	70-ton "	Eureka Crystal Ice Co., Fort Smith, Ark.	1	10-ton "
Omaha Brewing Association, Omaha, Neb.	1	75-ton "	Midland Hotel, Kansas City, Mo.	1	10-ton "
Kansas City Ice and Cold Storage Co., Kansas City, Mo.	1	100-ton "	Chas. Wolff Packing Co., Topeka, Kan.	1	30-ton "
Sedalia Ice and Cold Storage Co., Sedalia, Mo.	1	30-ton "	Iola Ice and Cold Storage Co., Iola, Kan.	1	30-ton "
Kansas City Ice and Cold Storage Co., Kansas City, Mo.	1	250-ton "	Coates House, Kansas City, Mo.	1	16-ton "
Ryan & Richardson, Leavenworth Kan.	1	100-ton "			

CORRESPONDENCE SOLICITED. P. O. ADDRESS, STATION A.

THE BALL MACHINE

Was Installed during 1899 in the Following Plants:

Swift & Company, . . .	One Machine Compound Condensing Engine,	500 tons.
Hammond Packing Company, .	Two Machines Compound Condensing Engines,	500 tons.
Nelson Morris & Company, .	One Machine Non-Condensing Engine, .	250 tons.
Mound City Ice & Cold Stor. Co.,	Two Machines Compound Condensing Engines,	500 tons.
Columbia Brewing Company, .	One Machine Non-Condensing Engine, .	250 tons.
Capitol Brewery Company, .	One Machine Non-Condensing Engine, .	75 tons.
Union Brewing Company, .	One Machine Non-Condensing Engine, .	50 tons.
Poplar Bluff Ice Company, .	One Machine Non-Condensing Engine, .	50 tons.
Malden Ice Mfg. Company .	One Machine Non-Condensing Engine, .	25 tons.
Citizens Ice Company, . .	One Machine, Absorption, ...	50 tons.
Wm. E. Ralph, ...	One Machine, Absorption, ...	50 tons.
Peoria Ice Company, . .	Generator-Condensers, etc., Absorption, .	100 tons.
Vigo Ice Company, ...	Generator, etc., Absorption, ...	100 tons.
Hammond Packing Company, . . .	2-inch Direct Ammonia Piping,	150,000 feet.
St. Louis Dressed Beef and Provision Company,	2-inch Direct Ammonia Piping,	50,000 feet.

THE above 500-ton machine, installed for Swift & Company, the largest packers in the world, is the fourth machine of this size and tenth order furnished them . . . It is therefore unnecessary to speak of the durability, economy, efficiency and general success of this machine . . .

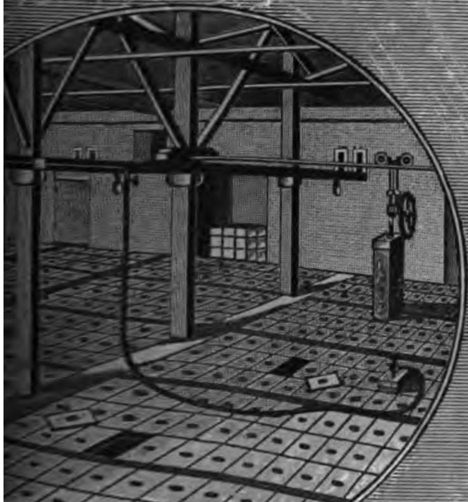
ICE & COLD MACHINE COMPANY

ST. LOUIS, MO.

Vol. 18 · No. 3

March, 1900

Ice and Refrigeration Illustrated



H. S. Rich & Co.
Publishers
Chicago & New York

THE TRIUMPH ICE MACHINE CO.

CINCINNATI, OHIO

Gone are the days of the Ice Convention,
Gone, nearly gone, are the short wintry days;
Then, as gently steals in the warm breath of spring,
With a start, What Repairs, meet the Ice Man's gaze.

But nothing undaunted, for now he feels sure,
With the lessons learned down on Mobile's sunny shore,
That his troubles will vanish, and to success,
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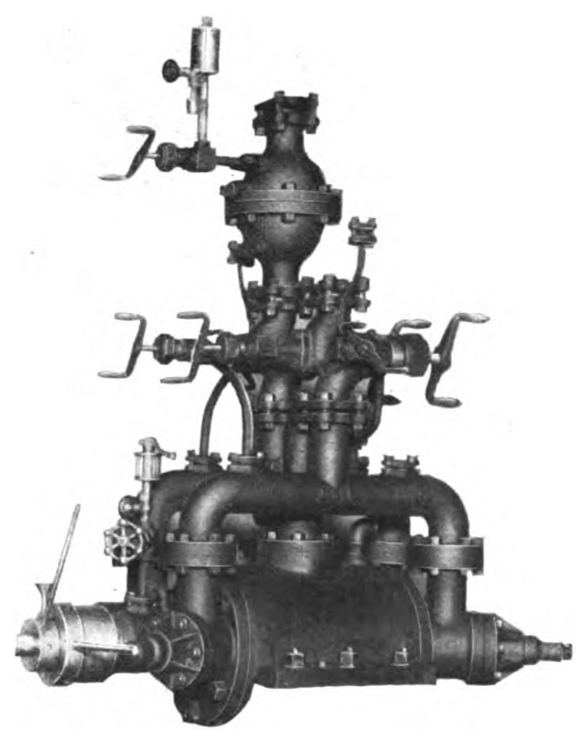

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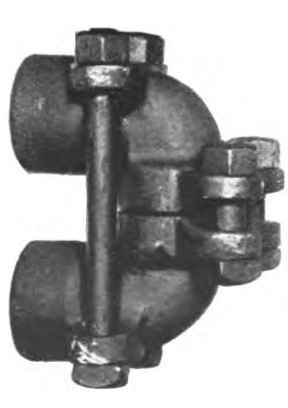

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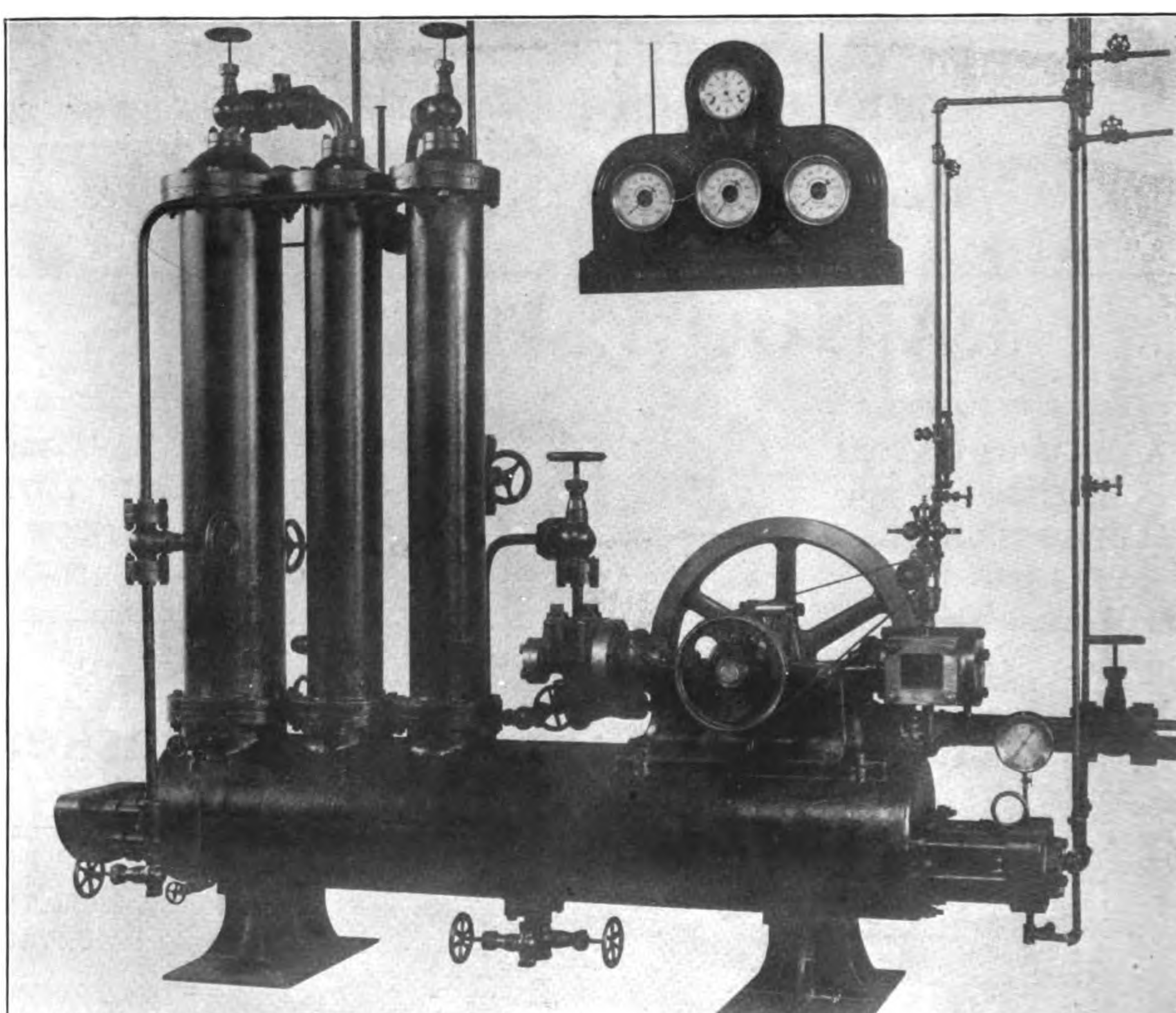

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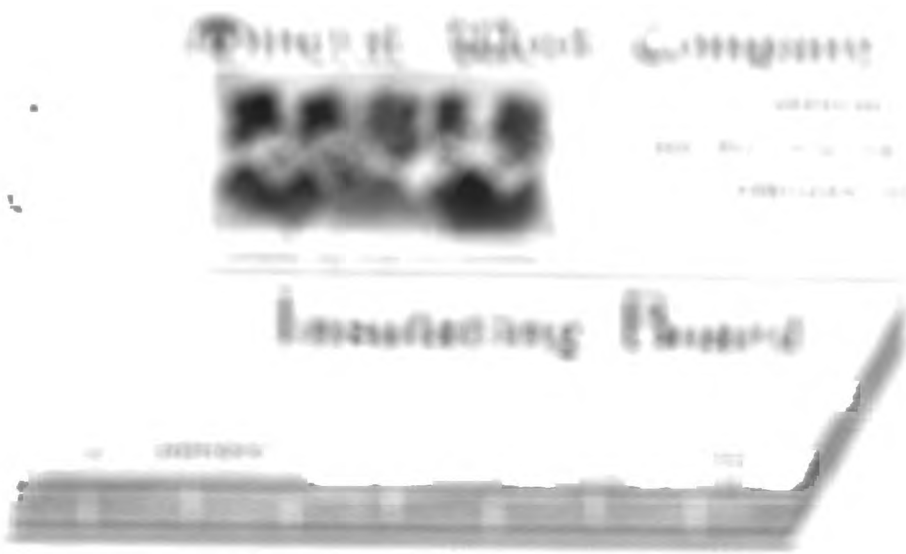

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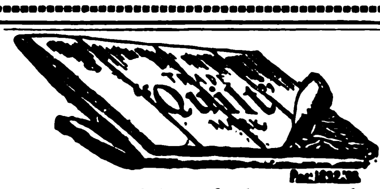

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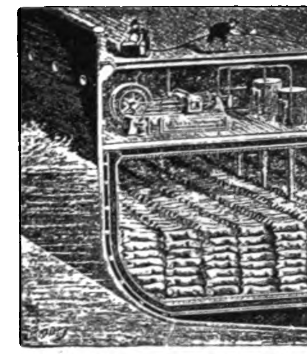
THE CO-OPERATIVE WHOLESALE SOCIETY, LTD., 1 Balloon St., Manchester.
JAS. FERNIE, ESQ. (Agent for J. & E. HALL, LTD.) October 13, 1899.

DEAR SIR: In reply to your letter of October 6, respecting the Refrigerating Machinery which we have had from Messrs. J. & E. Hall, Ltd., for our Irish Creameries, we have pleasure in stating that we have found the machines very efficient, and they have given us every satisfaction. They quite come up to the guarantee you originally gave us as to their capabilities. There is no danger in the working of the machines, which are so simple that no skilled hand is required to take charge of them. Another satisfactory feature is the absence of smell. Yours truly, pro Society. Signed, J. BRODRICK.



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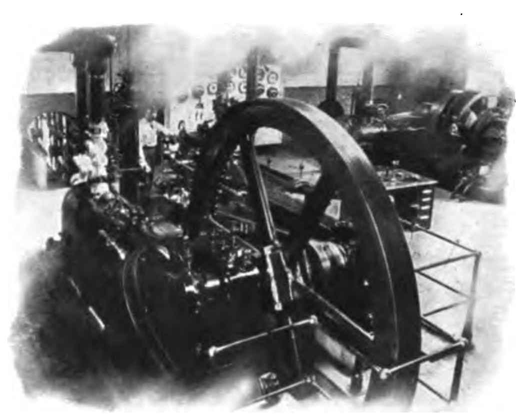

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ICE AND REFRIGERATION ILLUSTRATED

A Monthly Review of the Ice, Ice Making, Refrigerating, Cold Storage and Kindred Trades.

VOL. XVIII. No. 3. CHICAGO : NEW YORK : MARCH, 1900. $2.00 PER ANNUM.

[*Special Stenographic Report with, Illustrations, Made Expressly for* ICE AND REFRIGERATION.]

Annual Convention of the Southern Ice Exchange.

COMPLETE DETAILED REPORT OF THE PROCEEDINGS OF THE ELEVENTH ANNUAL MEETING OF THE SOUTHERN ICE EXCHANGE—PAPERS OF INTEREST READ AND DISCUSSED—ELECTION OF OFFICERS FOR THE ENSUING YEAR—PORTRAITS—THE BANQUET—LIST OF DELEGATES ATTENDING.

THE eleventh annual convention of the Southern Ice Exchange was held in Mobile, Ala., February 22, 23 and 24, in the German Relief Association hall.

Delegates were present from the states of Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maine, Mississippi, Missouri, New York, North Carolina, South Carolina, Ohio, Pennsylvania and Tennessee. Chicago sent the largest delegation, the number being eighteen, including the ladies. The party left Chicago in a special car, and were joined en route by several delegates from other points. There was not, however, as large an attendance as had been hoped for. A number of members sent telegrams and letters stating their inability to be present for various reasons.

Most complete preparations for the entertainment of the delegates had been made by the local committees having the matter in charge, a very enjoyable programme having been arranged for each convention day.

The committee on arrangements and reception committee were composed of the following gentlemen:

Committee of Arrangements.—A. S. Lyons, chairman; A. Kling, L. Lyons, H. W. French, J. B. Webster, John Barbich, L. A. Partridge.

Reception Committee.—Pat. J. Lyons, chairman; L. P. Hart, S. J. Whiteside, D. P. Burns, R. W. Hopkins, Richard Mellett, J. G. Jenkins, G. E. Aunspaugh, A. G. Levy, A. H. Spira, W. S. Daffin, George A. Poetz, Samuel Lapham, A. N. Hill, Chas. Tobler, C. J. Michaeloffsky.

W. J. RUSHTON, BIRMINGHAM, ALA.
President Southern Ice Exchange.

To Mr. A. S. Lyons, chairman of the committee of arrangements, special praise is due for the admirable manner in which he provided for the entertainment and comfort of the delegates and their friends. He was most successful in carrying out the arduous task assigned to him, and the delegates thoroughly appreciated the delightful entertainment offered them.

The delegates registered on their arrival, and were provided with badges and programmes for the convention days; special badges being provided for the ladies, of whom there were quite a number, which added materially to the enjoyment of the occasion. The various features of the entertainment are given in the order in which they occurred.

The programme of the meeting, as originally set forth in ICE AND REFRIGERATION, was practically carried out, with the exception of the opening session, which was scheduled to commence at 12:30 P. M., in place of 10 o'clock, as advertised.

On arrival at Mobile the delegates found everything in their favor, and particularly the weather. They possessed a vivid remembrance of the meeting last year in Chattanooga, Tenn., at which place the blame for "refrigerating the town" was shouldered on the poor ice man. Strange to relate, the city of Mobile had just come through heavy weather, which had lasted one entire week—continuous heavy downpours, mingled with even ice and snow, having been meted out to them pretty generously. The delegates, therefore, with one accord, considered themselves entitled to congratulations

that they fortunately had missed the "event" by just one week, thereby saving their reputation without recourse to "repair" or "insulation."

A complete list of those present will be found on another page.

FIRST DAY'S SESSION, FEBRUARY 22.

The opening meeting was held on Thursday morning, February 22, in the German Relief Association hall. The meeting was called for 12:30, and the delegates gathered in goodly numbers at that time, and after waiting half an hour for President Hart's appearance, Mr. Rushton announced that while awaiting the arrival of the president, applications would be taken by the secretary from any of those present desiring to join the Association, who were not already members.

At this juncture President Hart, and three or four friends with him arrived, and a round of applause greeted the president.

The meeting was called to order by President Louis P. Hart at 1:30 P. M., who said: "Gentlemen, please come to order. I am sorry for the delay I have occasioned, but it was caused by the railroad train, and not by me. The train was forty-five minutes late. I have the pleasure of introducing to you the honorable the mayor of Mobile, Mr. Bush."

The Hon. J. C. Bush, mayor of Mobile, Ala., then addressed the meeting as follows;

Gentlemen of the Southern Ice Exchange: I regret very much that I am not in condition to-day, having taken quite a severe cold. I want to assure you, however, that I do not attribute it to your presence in the city. We had thought last week that we would honor you gentlemen with an ice palace, made out of natural ice, but thought it would not be right to go into competition with you, so we abandoned that idea.

We are here to receive you and to welcome you into our midst, not only on our own account, but on behalf of our fellow-citizens. In our southern states, and particularly in Alabama, we are interested in the manufacture of our natural products.. You have a great advantage in one respect, that the raw material is so cheap, so much so that I thought I would like to be in the business myself, because there is no old stock left over, and I notice how well the ice men look; a pretty good crowd to get into. As I said, we are interested in everything in the shape of manufactures in our country. The trouble with our people in the past has been, that they have been waiting for somebody to come and do the work for them; and the fact of the matter is, that it will never be a great country until we manufacture the raw materials that we have. A gentleman said to me the other day: "The state of Alabama is the finest state in the Union, but they need more progression." We have never accomplished anything because we have waited and waited for some one to come to us and give us pure water; waited and waited for some one to furnish us with sewers; waited still further for some one to pave our streets; and we never accomplished anything until we determined to do it ourselves.

I heard the other day of an old nigger, whose experience in praying was a funny one. He said his experience in praying to the Lord was like this: Whenever he asked the Lord to send him a chicken, the chicken never came; but that when he asked the Lord to give him strength to go and get the chicken, why he got the chicken every time. I just feel that this is largely the same with us—we can get what we are after when we are determined to get it.

We are glad to have you with us. We have in this city a large amount of improvements, not apparent to the eye, being nearly all underground, but we are hoping to have our city greatly improved on the surface also, so that when our friends visit us we will not have to be ashamed. I thank you in behalf of this city for your visit among us, and I am sure we appreciate it. Am glad always for gentlemen in different parts of the country to visit us. I like these active, strong, good looking business men, and I hope, gentlemen, you will have a very pleasant session while here. I want to say further that things generally even up in this world; as a friend of mine in St. Louis once said: "You have your trials and troubles, your prosperity and adversity; things come and go, and go up and down, but they generally wind up equal all round." The ice man has it in summer, and the coal man has it in the winter; they even up there. But we want to change all that, and see that both rich men and poor men get their ice in the summer and their coal in the winter.

I think you should establish all of your plants here, because we have more good weather here than any other place in the world.

It gives me pleasure to welcome you to our city. I ask you to enjoy yourselves, and that when you go from here, I hope you will come back again. [Applause.]

President L. P. Hart responded as follows:

Mr. Mayor: In behalf of the members of the Southern Ice Exchange, it is my duty to thank you for your cordial welcome. This Exchange meets once a year for the purpose of hearing papers read, and to discuss the same for the mutual benefit of all concerned, and to obtain and disseminate information that will be beneficial both to the consumer and the manufacturer. When we decided at our last meeting in Chattanooga to meet in Mobile this year, I was glad, because, personally, I knew of the warm hospitality of this place, and knowing full well how Mobile feels in the matter, I am convinced that we have chosen the right place to meet for the eleventh annual convention. Again I thank you, Mr. Mayor, for your cordial welcome, on behalf of the members of the Southern Ice Exchange.

President HART: The first business in order is the calling of the roll. We can dispense with it on account of the lateness of the hour.

Mr. RUSHTON: I move to dispense with it. The motion prevailed.

President HART: The next thing in order is the reading of the minutes. I think it is a good idea to have them read. It was very cold at Chattanooga last year, and consequently a very small selection of the members was present.

Mr. RIGGS: I move that, inasmuch as the minutes of the "freeze out," held at Chattanooga last year, were published by ICE AND REFRIGERATION, that we dispense with the reading. [The motion prevailed.]

President HART: The report of the secretary and treasurer is in order:

Secretary and Treasurer Worth then read his report, showing receipts from all sources, including balance left over, to be $2,417.82, with expenses of $705.84, leaving a balance on hand of $1,711.98. He reported the present membership to be 176, showing a substantial increase over the previous year.

President HART: You have heard the report of the secretary and treasurer. What is your pleasure?

Mr. BENJAMIN: I move that it be referred to the finance committee. [The motion prevailed.]

Secretary Worth then read the following communication.

MOBILE LODGE, No. 108, B. P. O. ELKS,
MOBILE, ALA., February 19, 1900.

MR. A. S. LYONS, CHAIRMAN SOUTHERN ICE EXCHANGE, MOBILE, ALA.:

Dear Sir.—In behalf of Mobile Lodge, No. 108, B. P. O. Elks, I extend to the Southern Ice Exchange a cordial invitation to attend a stag social session, tendered to the Peters Comedy Co., at the lower floor, German Relief hall, on Thursday, February 22, at 10 o'clock P. M. Your badges entitle you to admission. We hope to make you have a "hot time."

Respectfully yours, (Signed) C. L SCHWEIZER,
Secretary.

President HART: Gentlemen, you have heard the communication read. What is your pleasure?

Mr. LAPHAM: I move that it be accepted and the secretary instructed to return thanks. [The motion prevailed.]

President HART: We will not have any papers read, as we have a boat ride on hand. The boat leaves

at 2 o'clock from the foot of St. Louis street. A motion to adjourn will be in order.

Mr. RIGGS: I move we adjourn. [The motion prevailed.]

Mr. RUSHTON: Just wait a minute, gentlemen. A photograph of the delegates in a body will be taken tomorrow morning, at 9:15 sharp, diagonally across from the Battle House hotel. Be there sharp with your ladies at 9:15.

The meeting then adjourned.

BOAT EXCURSION ON MOBILE RIVER AND BAY.

The delegates and their ladies assembled at the wharf at 2 o'clock, and boarded the steamer *D. L. Tally*, which had been chartered by the entertainment committee for the occasion.

Promptly at 2:15 o'clock, amid the ringing of bells and the tooting of whistles, the above named craft left the pier and proceeded down the river for a continuous run embracing some thirty-seven miles, made in a circuit, and taking in not only Mobile river and bay proper, but also the Spanish, Raft and Kennesaw rivers.

Quite a large number of the friends of the local members joined the delegates in this boat ride, including a number of the celebrated "Belles of Mobile," who helped in a very large measure to make the trip pleasant to all. In this connection honorable mention is due to Miss Lyons, the accomplished sister of Chairman Lyons, of the entertainment committee, who assisted so admirably in her charming manner in entertaining the delegates, and their accompanying ladies.

During the progress of the trip, a substantial luncheon was served to all on board, which, according to the verdict rendered by the majority participating, "hit the right spot."

After the luncheon was cleared away, a musical programme was rendered, the following talented artistes taking part: Mrs. J. O. Dickens sang very sweetly "The Suwanee River," and also the "new-time" favorite "Hello, Ma Baby," both of which were enjoyed immensely. Miss Marie Davis, a beautiful Mobile girl, favored the happy, joyous crowd with "The Boy Guessed Right" (from the "Runaway Girl"), which was fully appreciated by all. Mr. Walter Sarjeant sang the song entitled "O, Promise Me," the rendition of which was much enjoyed. Taking all in all, a most happy and agreeable time was enjoyed by all, and to help matters, the weather was perfect.

THE STAG SOCIAL.

Pursuant with the acceptance of the invitation by the Mobile Lodge, No. 108, B. P. O. Elks, the delegates attended the Stag Social Session given by that lodge at Germania Relief hall on the evening of the 22nd.

The chairman for the evening was the Hon. C. L. Lavretta, ex-mayor of Mobile, who kept the assemblage in a continuous uproar by his wit and humor.

After the members of the lodge had been "raked over the coals" and fined indiscriminately for being "present" or "not present," or for being "too ready" or not "quick enough" to answer the roll, the chairman ordered the Elks to wait upon their guests with refreshments, at the conclusion of which there were more "roasts" for the Elks. The ice men then came in for their share of the "fun," and were called up before the chair and passed through the ordeal that caught many of them unprepared. They contributed their share to the funds by the payment of fines of five cents, ten cents and "two bits," the chair stating that all funds collected for the evening would go to the object of charity. The festivities and high revelry continued until an "early" hour.

W. S. WARE, JACKSONVILLE, FLA.
Vice-President Southern Ice Exchange.

LOUIS P. HART, NEW ORLEANS.
Retiring President Southern Ice Exchange.

WM. E. WORTH, WILMINGTON, N. C.
Secretary and Treasurer Southern Ice Exchange.

SECOND DAY'S SESSION.

Pursuant to adjournment, the Exchange reassembled in the German Relief hall, and the meeting was called to order at 10:45 A. M., with President Hart in the chair.

President HART: The first business in order is

the appointing of a committee to audit the accounts. I therefore appoint Messrs. Riggs, Berton and Rettig, and they will report to-morrow morning. The next business in order is the report of the executive committee.

Mr. Rushton, chairman, asked for further time in which to present report.

President HART: The next business in order is the election of members.

Secretary Worth then read the following applications:

George J. Stocker, St. Louis, Mo., associate.
Gadsden Light, Coal and Ice Co., Gadsden, Ala, active.
M. A. Garrett, Chicago, Ill., associate.
Alfred Siebert, St. Louis, Mo., associate.
George M. Davis & Son, Palatka, Fla., associate.
York Manufacturing Co., York, Pa., associate.
A. H. Barber Manufacturing Co., Chicago, Ill., associate.

President HART: You have heard the applications read. What is your pleasure?

Mr. RUSHTON: I move that the secretary be authorized to cast a ballot for the election of these people as associate and active members, respectively.

The motion prevailed.

President HART: The secretary is directed to so cast the ballot.

Secretary WORTH (in casting the ballot said): I declare the York Manufacturing Co., George M. Davis & Son, Alfred Siebert, A. H. Barber Manufacturing Co., M. A. Garrett, Chicago, Ill., Gadsden Light, Coal and Ice Co., George J. Stocker, members, and hereby cast the ballot for their election and declare them duly elected.

President Hart then called for papers to be read.

President HART: The first paper to be read is on the subject of "Cooling Towers," and will be read by Mr. George J. Stocker, of St. Louis, Mo.

Mr. Stocker then read the following paper:

COOLING TOWERS.

Mr. President and Gentlemen of the Southern Ice Exchange: Many of the inquiries I received in the daily routine of my business about cooling towers convince me that there still exists a great deal of darkness about the functions of this apparatus. Some people seem to be of the opinion that a cooling tower is a kind of a substitute for an ice machine, as, for instance, a party of Greater New York, who wrote me the other day that: "We will not go to the expense of an ice machine, but think a cooling tower will do instead." Others imagine that for a cooling tower they can dispense with water entirely; but even where a better understanding might be expected, the questions invariably asked give ample proof of the fact that clear ideas, at least of the principles on which the working and efficiency of a cooling tower depend, are not so generally disseminated as might be supposed.

It shall give me pleasure, therefore, if by reading this paper, at the request of your committee, I may be able to contribute something to a clearer perception of a device which is more and more destined to play an important part in the economy, especially of your industry.

The contrivances for the cooling of liquids may properly be divided into two principal categories; the first including the devices commonly called: Circulating apparatus, where the heat is absorbed and carried off by a liquid beforehand cooled, as, for instance, with the brine system in ice making and refrigerating plants, or for the cooling of worts in breweries; while to the second category belong those where refrigeration is principally effected by evaporation.

It is of the latter group, represented by what is usually called "cooling towers"—though this designation in its general application is a misnomer—that I propose to speak. To begin with, allow me to call to your memory first, some of the physical laws on which the theory of evaporation rests.

Evaporation is conversion of a fluid into a vapor. When a liquid, such as water, is freely exposed to the atmosphere, the stratum of air in contact with its surface becomes more or less charged with vapor. Evaporation proceeds only from the surface of fluids, and must therefore, other things being equal, depend on the extent of the surface exposed.

Moderately dry air absorbs moisture, at first with avidity, but as it becomes saturated, the process proceeds more and more slowly, and finally ceases. Evidently, therefore, the more rapidly the air is removed, the more rapidly evaporation proceeds.

The capacity of air for carrying moisture increases rapidly with the temperature. At 202° saturated air holds about 100 times the weight of water that would saturate air at 32°. If air at 62°, saturated and holding .000881 pounds of vapor per pound of air, is suddenly heated to 72°, it will then no longer be saturated, because at this latter temperature it could hold .001221 pounds. It has, therefore, only 73 per cent of vapor that would saturate it. On this fact depends the philosophy of evaporation.

By the conversion of water into the vaporous state a great amount of heat is absorbed by the vapor, and becomes latent, *i. e.*, insensible to the thermometer. With every pound of water evaporated about 1,000 units of heat thus disappear. The heat thus required must be derived from the liquid, consequently its temperature decreases. But as a body having a lower temperature than its surroundings receives heat from without, refrigeration cannot go on *ad infinitum*. It is arrested when the same amount of heat that is absorbed by evaporation is supplied from without, while evaporation itself comes to a standstill when, with the lowering of temperature, or elastic force of the forming vapor, and consequently its density approaches that of the vapor contained in the ambient air, as then no further heat exchange is possible; or at any rate, condensation and evaporation are at an equilibrium.

For each temperature there is a maximum of density, and hence of pressure which the vapor exerts. From these facts the rule may become intelligible: That the rate of evaporation at different temperatures is proportional to the difference of the elastic forces of the vapor at the surface of the liquid, and that of the vapor actually present in the ambient air; evaporation will consequently be the livelier, the greater the difference.

From the foregoing statements the conclusion may be drawn that the efficiency of a cooling tower depends:

First.—On the extent of the exposed water surfaces.

Second.—On the rate of air circulation, *i. e.*, the quantity of air brought in contact with those surfaces, which two propositions have reference to the construction of the cooling tower, and—

Third.—On the difference of the pressure of vapors at the water surface, and in the ambient air, which is regulated by the accidental conditions of water and air as to temperature and percentage of moisture. All three being conditional to the rate of evaporation.

I am, in this connection, well aware that besides evaporation, radiation and the contact of cold air with the water are to a certain degree also conducive to refrigeration. But, as evaporation is by far the most potent agency, we may neglect those other quantities without detriment to the correctness of our conclusions. Long before these physical laws have been generally understood, or have found expression in scientific formulas, has the practical sense of the people applied them, though unconsciously and in a very primitive way, to the satisfaction of its daily wants. Since immemorial times the Mexicans have cooled their drinking water by means of a kind of clay jar called "Olla." The process is simply this:

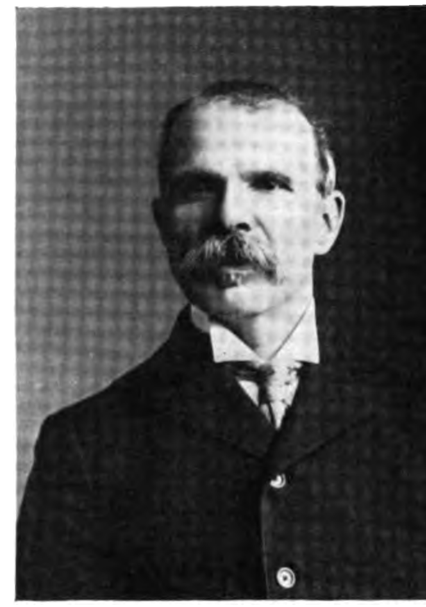
The liquid permeating the porous walls of the vessel, covers the surface with moisture, which, when the jar is vigorously swung to and fro, evaporates and absorbs thereby a great amount of heat from the water inside. In a similar way this simple method of producing cold is extensively used in India and other tropical climates for the cooling of beverages. A thick layer of straw is spread on the ground in the shade of a building, but exposed as much as possible to the wind; the bottles to be cooled are placed on it, more straw is lightly spread over them, and the whole is kept wet by frequent watering. With the air at 98° the bottles will cool in a wind to 65°, but in calm air to 70° or 75° only. As far back as 1776 we meet the rudiment of our modern cooling tower in use in Hindustan. In an old chronicle, an English traveler describes an apparatus framed of bamboo tubes and mats of palm leaves, by which the Indian grandees used to cool the water for their bath. The water, slowly poured over the cooling mats by hand, was gathered in a stone basin, and evaporation effected by means of fans, also operated by hand.

Hardly any improvement on this device is perceptible in the gradirworks still in operation in the Salzkamergut in Austria, wherewith the brine is evaporated. These gradirworks, or, better, evaporators, consist simply of a pile of thorn brushes, twenty, thirty and more feet high, held together by a framework of roughly hewn planks, over which the saline solution is pumped. The surface which these brushes furnish is so large that the natural current of air to which they are exposed is found to be sufficient to perform the required evaporating work. No artificial air blowers whatever are employed. But it is not until, with the generally growing and widespread production of artificial ice the necessity of an effective and reliable cooling tower became urgent, that its construction on a scientific basis has been taken up by trained engineers.

The cooling towers built in this country show a remarkable difference in construction and material, though all are governed by the same principles. All aim at the attaining of a large cooling surface, the even distribution of the water over them, and an effective circulation of air. Let me give you a short description of the different types mostly in use in the United States.

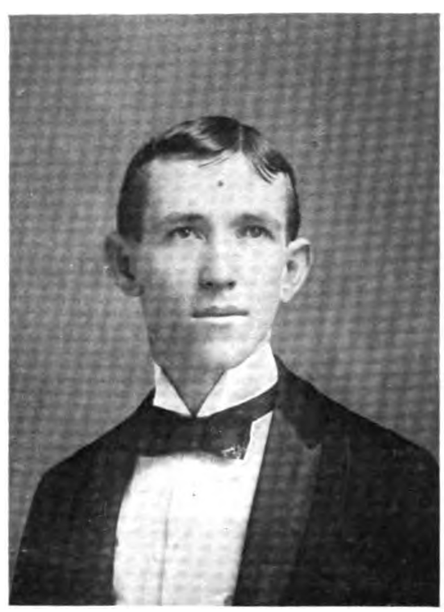
A. S. LYONS, MOBILE, ALA.
Chm. Com. of Arrangements and Member Ex. Com.

SAMUEL LAPHAM, CHARLESTON, S. C.
Chairman of Executive Committee.



SOL. BENJAMIN, ATLANTA, GA.
Member of Executive Committee.

M. W. THOMPSON, GREENSBORO, N. C.
Member of Executive Committee.



J. R. KELLER, PENSACOLA, FLA.
Member Executive Committee.

FRANK H. RIEKE, PADUCAH, KY.
Member of Executive Committee.

LEON BERTON, HELENA, ARK.
Member of Executive Committee.

C. D. WINGFIELD, RICHMOND, VA.
Member of Executive Committee.

B. F. LEARNED, NATCHEZ, MISS.
Member of Executive Committee.

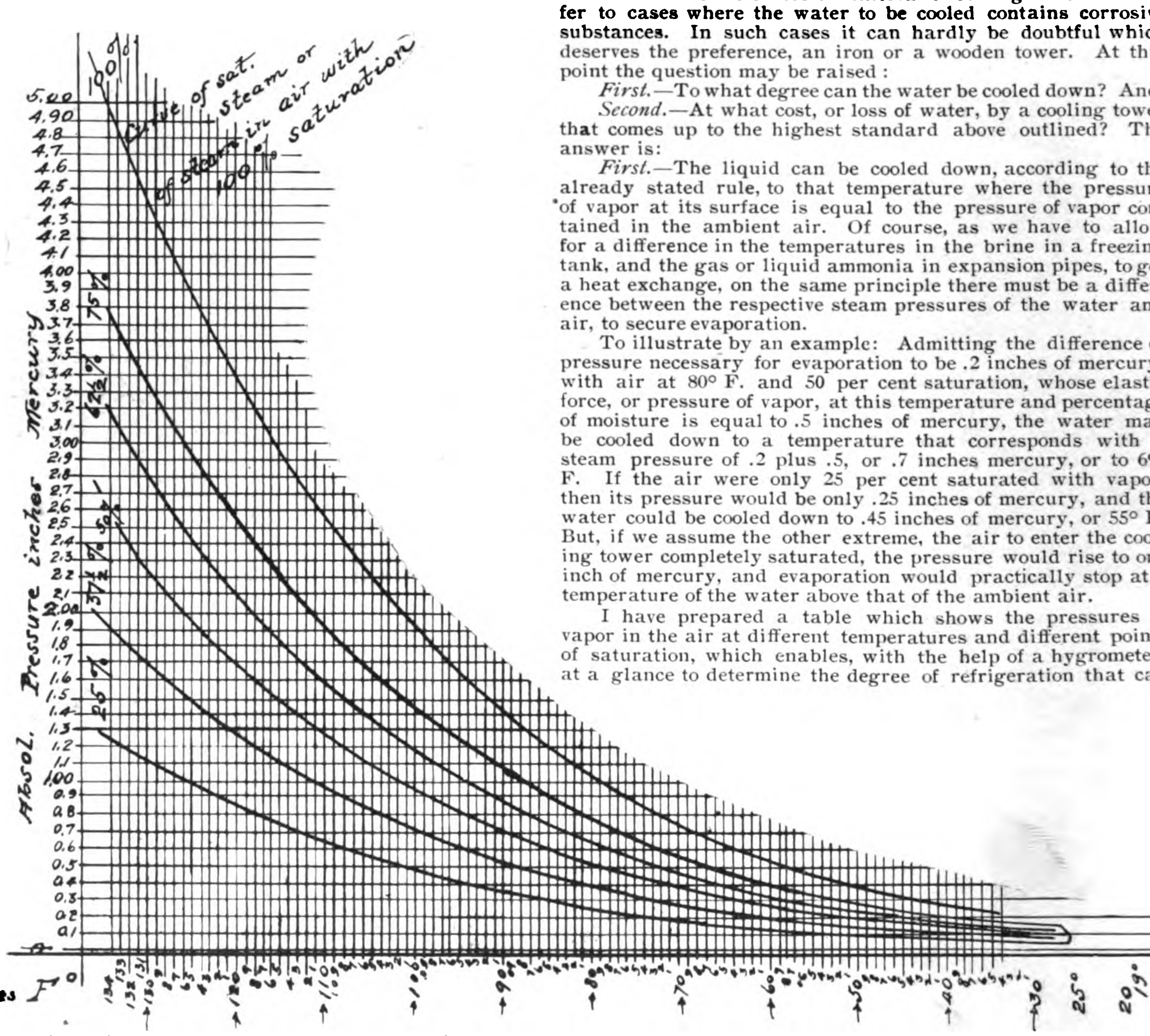
One of the first cooling towers introduced into the market (if I remember rightly) is that built by Worthington. It consists of a steel tower enclosing the evaporating surfaces which are made up of hard glazed tiles resting on "T" beam grating, or regalvanized tube tiling.

The Barnard cooling tower is also constructed, so far as the casing is concerned, of steel, but instead of tiles, within the towers are hung a number of mats of a special galvanized wire cloth.

The gradirwork, "Patent Klein," is built entirely of wood. The polygonal vertical shaft forms the frame for a checker work of boards arranged in horizontal layers.

All of these cooling towers are provided with only one fan, and the distribution of water over the cooling surface is uniformly actuated by a system of iron piping. The latest improvements in this line of cooling towers are embodied in the patents of my brother.

This cooling tower consists, in the main, of a strong wooden casing, the interior of which is made up of cross-pieces of boards in horizontal layers set at right angles to each other, and provided between their intersections with upright, oblique partitions. Special care is taken of an equal distribution of the liquid over the cooling surfaces. This is most successfully attained by a superior system of funnel shaped troughs at the top of the structure, eliminating entirely the occurrence of dry spots on the cooling surfaces. Instead of one fan only, this cooling tower is provided with two fans, mounted on one steel shaft at the base of the apparatus, which results in a more equal distribution of the air throughout the apparatus, while for the same amount of air discharged, the two fans can be run



at a slower circumferential speed, and require, therefore, less driving power.

Besides these cooling towers, especially constructed for the refrigeration of large quantities of liquids, there are a number of other cooling devices in existence, of which I shall mention here only the one built by the Linde Co., in connection with submerged condensers. The construction of this apparatus is as follows:

The condenser pipes are placed in an iron tank, in which the water is constantly kept in motion by a so called stirring apparatus. At the top of the tank a number of sheet iron cylinders, so arranged that they are immersed in the water below, with about one-third of their diameter, are made to revolve slowly around their axes, covering their surfaces thereby with water, which by being brought into contact with a current of air caused by means of a fan, evaporates and causes the cooling effect.

Of the "wild cat" towers that turn up from time to time, and whose seeming cheapness never tires people to experience their utter worthlessness, I wish to sound here a note of warning.

Being myself a manufacturer of cooling towers, it can, of course, not be my intention to express any opinion of the respective merits of the cooling towers above described, but I hope not to transgress when I venture some remarks about the materials used in their construction, which from different points of view are of great importance to the efficiency and proper working of a cooling tower. As already stated, evaporation is the result of the intimate contact of air with water. Undoubtedly an adequate construction of the evaporating surfaces will go a long way to attain this purpose, but the maximum of efficiency cannot be brought about independent of the materials of which they are composed. May the surfaces be ever so ingeniously arranged, if the liquid flows over them in streaks instead of an even distributed film, the effect is partly lost. Observe, for instance, how water flows over a glass pane, hard glazed tile or any other smooth surface. Instead of in a thin film it runs down in drops and streaks. Quite different with wood. Wood, by sucking up part of the liquid, becomes a strong adhesive medium, which secures not only a most even distribution of the water, but besides slackens its downfall to a highly desirable degree.

But there is another point of view not less important that must determine the choice of material of cooling towers. I refer to cases where the water to be cooled contains corrosive substances. In such cases it can hardly be doubtful which deserves the preference, an iron or a wooden tower. At this point the question may be raised:

First.—To what degree can the water be cooled down? And:

Second.—At what cost, or loss of water, by a cooling tower that comes up to the highest standard above outlined? The answer is:

First.—The liquid can be cooled down, according to the already stated rule, to that temperature where the pressure of vapor at its surface is equal to the pressure of vapor contained in the ambient air. Of course, as we have to allow for a difference in the temperatures in the brine in a freezing tank, and the gas or liquid ammonia in expansion pipes, to get a heat exchange, on the same principle there must be a difference between the respective steam pressures of the water and air, to secure evaporation.

To illustrate by an example: Admitting the difference of pressure necessary for evaporation to be .2 inches of mercury, with air at 80° F. and 50 per cent saturation, whose elastic force, or pressure of vapor, at this temperature and percentage of moisture is equal to .5 inches of mercury, the water may be cooled down to a temperature that corresponds with a steam pressure of .2 plus .5, or .7 inches mercury, or to 69° F. If the air were only 25 per cent saturated with vapor, then its pressure would be only .25 inches of mercury, and the water could be cooled down to .45 inches of mercury, or 55° F. But, if we assume the other extreme, the air to enter the cooling tower completely saturated, the pressure would rise to one inch of mercury, and evaporation would practically stop at a temperature of the water above that of the ambient air.

I have prepared a table which shows the pressures of vapor in the air at different temperatures and different points of saturation, which enables, with the help of a hygrometer, at a glance to determine the degree of refrigeration that can be expected at any temperature and percentage of moisture of the atmosphere. As a means of examining the efficiency of cooling towers it may be interesting.

The data which I have gathered during the past year, of the practical working of my cooling towers, corroborate to a nicety the above expounded theory. In the hottest summer months the water has been cooled down to a temperature from 8° to 17° below that of the atmosphere, according to the percentage of moisture contained therein.

We see herefrom that the percentage of humidity contained in the air determines the lowest degree to which refrigeration can be carried on by evaporation at different temperatures of the atmosphere.

GROUP OF DELEGATES AND LADIES ATTENDING THE ELEVENTH ANNUAL CONVENTION OF THE SOUTHERN ICE EXCHANGE, AT MOBILE, ALA., FEBRUARY 22, 23 AND 24, 1900.

Second.—Concerning the loss of water due to evaporation: As in every pound of water converted into vapor about 1,000 units of heat become latent, it evidently must be proportional to the total amount of heat thus absorbed and carried off, and consequently depend on the difference of the temperatures of the hot and the cooled liquid, or in other words, on the degree to which the water has been cooled down. If 100,000 pounds of water are cooled from say 130° to 70°, from every pound sixty units of heat have been absorbed, or *in toto* 6,000,000 units; and as in every pound of steam 1,000 units of heat become latent, 6,000 pounds, or 6 per cent of the liquid, have been evaporated. If the liquid had to be cooled from 160° (as for instance with steam condensers) to 70° = 90°, then 9,000,000 units of heat would have to be absorbed, and the loss of water by evaporation would be 9 per cent.

To come now to the manifold application of cooling towers, their economical advantages are in a great number of cases so evident, if we bear in mind that the necessary supply of water for condensing purposes is actually reduced by them from 5 per cent to 10 per cent of its former amount, resulting consequently in a saving of from 90 per cent to 95 per cent of water taxes, cost of pumping, depreciation of machinery, and last, but not least partly of wages, that I certainly shall not annoy you with a lengthy enumeration of them.

When all, or only a small portion, of the water has to be bought or pumped from a deep well or any other distant water source, it needs only a calculation of the simplest manner to find out whether a cooling tower pays or not; or, better said, to what amount it pays. But there are hundreds of other cases, though not so readily apparent, where upon competent examination of all appertaining circumstances a cooling tower would prove a most profitable investment, not only with regard to a reduction of current expenses, but to a steadier and safer working of the plant, and consequently greater production.

Whenever a remark is heard: "Well, I guess we will pull through without a cooling tower," you may be sure that a cooling tower would pay for itself in a very short time. "To pull through," means nothing else but to tax the machinery of the plant to the utmost, reckless of wear and tear; reckless, too, of higher expenses. In such times, which coincide almost always with the height of the season, one loses sight of the fact that, with every pound of higher pressure in the ammonia condenser, a corresponding increase in the horse power to operate the compressor goes hand in hand, and consequently a substantial increase in the coal bill, and one becomes heedless of the extraordinary and killing depreciation that invariably accompanies the overloading of any piece of machinery, be it a boiler, a steam engine, a compressor, or a pump.

Particularly, in connection with condensers for steam engines, the benefits of cooling towers are not sufficiently appreciated yet. It is safe to assume that practically a condenser will save from one-fourth to one-third of the fuel, and it can be applied to any engine where a sufficient supply of water is available. A cooling tower renders you independent of the water question in any locality.

To bring this paper to an end, allow me to call your attention still to some other features of cooling towers, on which usually sufficient stress is not laid. I allude:

First.—To the fact that the operation of a cooling tower needs practically no attention whatever. It involves no additional duties on your engineer. Besides, there is no risk of its becoming out of order. A cooling tower may be in constant use for years and years without the need of the slightest repairs.

Second.—A cooling tower can be placed almost anywhere without interfering with its efficiency and usefulness. When no convenient available room is to be had on the ground, it can most advantageously be located on the roof of a building above the ammonia and steam condensers.

Third.—A cooling tower is a very efficient purifier of polluted water. In a properly constructed basin the mud and other impurities settle down very quickly, and the water becomes, in a short time, almost perfectly clear. In St. Louis, for instance, where the water is usually polluted to a high degree, condensers, which had to be cleansed before at least every four weeks, do not need, after the use of a cooling tower, any cleaning in years.

The paper was well received.

President HART: What is the pleasure of the meeting on the paper read?

Mr. RUSHTON: Move that the thanks of the Association be extended to Mr. Stocker.

The motion prevailed.

Secretary WORTH: We have a "red hot" paper here on the "Ice Man."

President HART: You will please distribute them among the members.

Mr. RUSHTON (referring to the "cold deal" above referred to): I move that the reading of these papers be dispensed with until after the meeting.

President HART: I have an apology to make, gentlemen. It was my intention yesterday to have read an opening address to you all, but as I was late, and arrangements had been made to go on the river at 2 o'clock, I could not do so. Then to-day I made up my mind not to read it, but at the suggestion of several of the members I have consented to do so. I hope you will take it as though read yesterday at 12:30.

The president then read his "Address of Welcome," which was well received, and which is as follows:

PRESIDENT'S ADDRESS OF WELCOME.

To the Members of the Southern Ice Exchange: I extend a cordial greeting to the members of the Southern Ice Exchange, and welcome your presence to-day, trusting that you all have had a very prosperous year in 1899, and that the new year of 1900 will be even more prosperous than the past one. For the information of the new members, let me say that the Southern Ice Exchange was instituted eleven years ago in Chattanooga, for the purpose stated in article II of the constitution, which reads as follows:

That the objects of the Exchange are to secure co-operation among ice manufacturers and allied interests, to further and protect their interests and prosperity; to encourage and forward in every way all improvements in the manufacture and handling of ice, gather and disseminate practical and useful information relating to the ice manufacturer's business, to promote social intercourse among the members of the Exchange, cultivate friendship and good will and encourage all good qualities of head and heart and keep good fellowship among all of its members.

You will notice that the real object is a social one; it enables us to meet one another once a year, cultivate friendship and good will (it is needed in the ice business), encourage all good qualities of head and heart (of course all ice men have these, only I wish you to take note that they want to be encouraged), and last, but not least, to keep good fellowship among all members. This is easy. Good fellowship exists at all times among all members. Who ever heard of any difference between two ice men? Of course, at times a man having a factory on the line of a railroad will feel a little sore because another factory sends in a sack of ice into what he considers his territory; but when the aggrieved party reads article 2 of the constitution (remember what it says: "Cultivate friendship and good will"), he then at once sends a sack of ice into the other fellow's territory at a cut price, and thus encourages good qualities of the head and heart.

Again, we believe that a more perfect acquaintance of the men engaged in the same line of business in the south is desirable. That is one reason, my friends, we meet once a year. There is nothing like getting acquainted. Why, I have known of instances where an ice factory that had for years what the boys would call "a lead pipe cinch." Another chap would build a factory in the same town; prices would be cut and the perfect acquaintance of the men engaged in the same line of business would not exist. But then comes the annual meeting of the Southern Ice Exchange. These men meet; they are introduced to each other; they fall on each other's neck; they at once form a perfect acquaintance; they go home full of the good time they have had at the meeting, and of the knowledge they have absorbed; patch up their differences; each one says he whipped the other, but both bless the Southern Ice Exchange. At these meetings each year we have papers read, and we discuss various topics. Just think what an opportunity these meetings have been, and will be, to bring forward to the world literature that would have been unknown! what a golden opportunity to educate the ice manufacturer! as we all must admit that these papers are an educator; they are printed in our official organ, and thus are handed down to posterity; and in after years, when our children and our children's children read and re-read them, they will say, What a blessing the Southern Ice Exchange has been, to enable our ancestors to disseminate such knowledge!

To you all I say: Keep up the good work; let the meetings of the Southern Ice Exchange be held annually; let us try, each one of us, to enlarge its membership, and let us all during the year 1900 try and bury all differences; let the ice man during the year make close alliance with General Prosperity, who now seems to have conquered this great country of ours, and in 1901 come together again with light hearts, and

propounded if the members desire to have me do so.

President HART: Mr. Ware, of Jacksonville, Fla., has a paper to read on "Insurance."

Mr. W. S. Ware then read his paper, which is as follows:

INSURANCE.

Mr. President and Gentlemen of the Southern Ice Exchange: The question of fire insurance has been very forcibly brought to my attention the past year by the different interpretations put upon a contract after a loss, and the amount of insurance that was payable to the insured, and the version of the insurance company of its liability in the following contract, which I give verbatim.

Contract. (Upon his machinery and apparatus connected with and used in operating the business of manufacturing ice, while contained in his frame, metal and black diamond roof ice factory building and the boiler house adjoining, situated —etc.) This was the only clause that referred to the machinery, and under this clause the insurer claimed that the stock of fittings of various kinds, amounting to about $500, the tools of all kinds, costing some $800, and the distilled water apparatus for the ice machine proper, together with the brine and charge of ammonia, were not insured. The reason of there being such a large stock of fittings and tools is because the plant was situated away from the shops and such supplies. But according to Webster and other authorities they were included in the insured property even if they were not enumerated. The insured property comprised two 10-ton Stratton absorption machines, complete, and there was as much damage done as could have been unless the ammonia boiler had exploded; but fortunately the packing gave away and the charge blew out. The insurance was $4,000, and a settlement was made for $3,500, rather than contest it in the courts, but I believe that the full insurance could have been collected. To look at the plant the day after the fire, if there had been $10,000 on the plant, you would have never questioned but every cent could have been collected on demand. I do not think I ever looked on what seemed to be a more worthless heap of trash; but it was deceptive, as two thoroughly first-class machines have been reconstructed from that trash pile, and in less than six weeks, with a complete overhauling of everything, they will make as much ice as ever. So to my mind it is useless for users of absorption machines to carry large insurance; but be sure of the specification of your policy, that it covers the ground, especially mentioning all tools and machinery used in erecting or repairing machines, fittings and supplies of all kinds is stock used in ice machinery. Ammonia in machine, brine in bath, and all kinds of piping, coils or machinery whatsoever, whether in use or in stock that is designed to be used by the insured for the manufacturing of ice or distilled water.

I think a careful study of the specifications to meet our especial requirements may save us both money and trouble, in case we are unfortunate enough to try and collect a policy. I find there may possibly be a vast difference in the interpretation of the specification of a policy between the agent and the adjuster; while both may act from unbiased motives, neither is supposed to understand the other's particular branch. One is hunting revenue, and the other saving expense, and the adjuster is not to blame if the specification is not worded correctly. I would suggest that our official paper request parties having made a study of this particular branch of our protection, to send specifications for compression and absorption machines, cold storage plants, etc., for publication, that we may all have the benefit of their experience. In Jacksonville we are cursed with the 75 per cent co-insurance clause, and I have eliminated from our insurance the ammonia boilers, absorbers, freezing tanks and their contents, except ammonia, also all foundations of machinery, buildings and boilers; and I found by the fire referred to above that we can well afford to carry those risks, as the only damage done to them was, the packing was either burned or blown out, which of course saved the exploding of the boilers. I think a little attention along these lines will not only save us money on the amount of insurance carried, but in case of a loss, lots of trouble.

I will give an idea of a form of contract:

"$000 on their .... story .... ice manufacturing and cold storage plant, including foundations, refrigerators, cold storage vaults and appurtenances, elevators and attachments, shed and platforms attached.

"$000 on machinery and machines of every description, in use and not in use, all steam, water and ammonia and pressure pumps, engines, ammonia boilers, absorbers, liquefiers, exchangers and their contents, including ammonia charge and ammonia on hand in packages, condensers, coils, piping, valves, indicators, distilled water, cooling and freezing tanks, cans, all tools, fixtures, implements, apparatus, utensils and materials of every description, usual or necessary to a complete ice manufacturing plant.

"$000 on their steam boilers, smoke stacks, connections, settings and foundations.

"$000 on their electric, gas or oil system of lighting.

"These, together with all attachments, settings and appliances, appertaining to each and any of the above, while contained in or attached to any of the above buildings, sheds or platforms, whether specifically mentioned or not.

"All of the above insured property being situated on their premises on the ....

"Privilege being given to make ordinary alterations and repairs; but it is understood and agreed that extraordinary alterations or additions are prohibited without written consent of this company.

"Permission granted: First, to manufacture all night; second, to use kerosene for lights, same being no less than U. S. Standard 110 per cent. Loss, if any, under this policy payable to ...., mortgagee, as his interest may appear."

Hoping that some one may be benefited by these suggestions, I thank you, gentlemen, for your attention.

The paper was well received.

President HART: The paper will take its usual course. I think the paper is an interesting one.

Mr. RIGGS: We have an insurance man here who seemed to be very well posted last night (a pathetic reference to the pleasant reminiscences the members of the Exchange had with the Elks the previous evening). I would like to hear from him.

Mr. HART: Who is the gentleman?

Answer.—Mr. George Haskell, of Chicago.

Mr. Haskell then stepped forward and spoke as follows: "If there is any question you gentlemen would like to ask me, I will be pleased to answer you."

President HART: Don't you think that the gentleman Mr. Ware referred to took out a co-insurance? He had $4,000 on two 10-ton machines. Why did they take out the 12½ per cent?

Mr. HASKELL (to Mr. Ware): My recollection of the paper is that your agent was remiss in the performance of his duty.

Mr. WARE: I was not interested in a dollar, except in the way of friendship. I went over to help my friend out. The agent said that: "You can collect your $4,000, but if I pay the full insurance on this machinery it will have to be specified—that is, the loss fully specified—whereas I can pay you a certain amount of money, cash right down." It was right in the beginning of this man's harvest, so every day was worth a great deal to him; he got his money that day, and got to running as quickly as he could. The large hotels were about to be opened, and he wanted to be going. That was the reason for the compromise.

Mr. HASKELL: The contract between the company and the ice man was this: They insured him against all direct loss and damage on his machinery and apparatus used in the manufacture of ice, while contained in his frame, metal and Black Diamond roof ice factory building and the boiler house adjoining, situated, etc. That did not contemplate the covering of the ammonia or anything else not specified in this contract; and if you were the insurance company, you would consider that you had made a very favorable adjustment under the terms of his contract, because you have not covered anything further than what is stipulated in this contract.

President HART: Suppose the parts were worth more than $4,000. Then what?

Answer.—If you have the same class of policies in Chicago they would become inoperative. (To Mr. Ware): Was not the loss more than $4,000?

Mr. WARE: The loss on the parts specified in the contract, in all probability was not less than $8,000 or $9,000, while those machines have been reconstructed for a great deal less money, they not having

been put up in the style that they were originally put up, and further than that, are sort of second-hand.

Mr. HASKELL: What was the value of the property covered by the contract?

Mr. WARE: At least $25,000. The point in my mind was simply to have him understand the policies. He thought his ammonia was covered. I naturally thought it was. Come to find out, it was not.

MOBILE—RIVER AND WHARVES.

Mr. HASKELL: Referring to Mr. Hart's idea, you have got to know what your value is to begin with.

Mr. WARE: That insurance clause was not in.

President HART: In this particular case.

Mr. WARE: The only compromise he made was to get his money at once in cash. The insurance company have a right to sixty days' time.

Mr. HASKELL: Suppose everybody burned up. They could not all have their money, and that is why these provisions are made so as to insure safety to the institution. We find that stipulation in all the standard policies of the day.

President HART: In this particular case I take it the insurance company did pay him in full. The rebate was on account of paying cash.

Mr. WARE: I desire to know how far we have to go toward specifying these things in the policy.

MOBILE—A COTTON WAREHOUSE.

What is a manufacturing machine? What constitutes the machine?

Mr HASKELL: The machine is that, with foundations and settings, and all that appertains to and is attached to the machine.

President HART: We cannot manufacture ice without brine, boilers and pipe. Have we got to specify everything connected with the manufacture of ice? Would the words, "machine, complete," cover it?

Mr. HASKELL: The word "complete" would not cover you. The introduction of this clause in your policy: "It is understood and agreed that the machinery, etc., and that this policy also covers ammonia, brine, and packages containing same," would help you some.

A voice: And all necessary fittings usually accompanying an ice machine.

Mr. HASKELL: In Chicago we cover these things in this way: After describing the machines, etc., "and all tools, implements, of whatsoever name and nature, used in the conduct of their business." You have got to use the clause, and have got to cover the articles you wish to insure.

Mr. RIGGS: This resolves itself down to the matter of getting the proper kind of a contract. The main point I want to know is whether an insurance will cover a policy as broad as Mr. Ware would like to have it drawn. I want to get some assurance.

Mr. HASKELL: I think that is a hard proposition, gentlemen. The idea is to give the insurer the legiti-

MOBILE—MOBILE BREWERY.

mate protection against loss from damage by fire. In Chicago we don't go into it as elaborately as this. The offices of the agent and adjuster are separate and distinct, both, however, operating on the lines of peace and harmony. We protect them in Chicago, and in my fifteen years' of experience no complaints on any loss have reached me; my customers have been protected.

Mr. RIGGS: There is a difference between Chicago and Alabama. We want protection south.

President HART: Suppose you had a 25-ton ice machine you wanted to insure, and you named the machine "complete." Doesn't that cover everything on the ice machine, ammonia, brine, etc. How could you get around it?

Mr. HASKELL: The machine complete in running order.

President HART: Suppose you were on a jury in an insurance case, and there had been a loss on an ice machine, and the policy read: "Ice machine com-

plete"; would not that in your mind cover the entire machine in running order?

Mr. HASKELL: A one 25-ton ice machine, complete. That would cover everything on that ice machine.

Question.—On the policy so drawn?

Answer.—Why, certainly. When you have an insurance man who does his part of it, you can well afford to leave the rest of it to the adjuster.

Mr. WORTH: Suppose that the ice machine insured is a compression ice machine, and another man has his machine insured who is an absorption ice man, and the absorption ice man gets burned out, and he takes the compression ice machine as his standard, where you have not the same number of pieces with the absorption as with the compression—would the insurance company refuse to pay for what is on the absorption machine that is not on the compression machine. What are you going to do with that?

Mr. RUSHTON: Does not the policy carry the name of the machine?

Mr. WORTH: The policy read: "One ice machine"; did not specify anything. They claimed the ice machine insured was not the ice machine that the insurance company insured, in so far that they had insured an absorption machine, when this was a compression machine.

Mr. HASKELL: Had the man changed the machines?

Answer.—No, sir; they refused, simply because the absorption machine had no distilling apparatus.

Mr. RIGGS: That was a case for the jury.

Mr. WORTH: And the insurance company paid them.

Mr. WARE: I wish to state that the adjuster, who came down to adjust this loss, was as fine a gentleman as I have ever had the pleasure of meeting, but he said that he could not consistently consider that the distilling apparatus proper of that ice factory was insured; that is, the distilling apparatus for the distilled water. This man that had the loss also sold distilled water, but had a separate apparatus for it. He also had distilled water for making ice, but the adjuster would not even include that distilled water apparatus. He said he was simply looking after the freezing part of it.

Mr. HASKELL: I think the gentlemen's position would be covered by the contract for the manufacture of ice.

Mr. BERTSCH: *Mr. President and Gentlemen of the Ice Exchange:* I believe the whole matter can be remedied by eliminating the words, "ice machine," and substituting the words, "ice plant." There is no doubt, as has been said, as long as we talk about an "ice machine," whether in running order or not, that we can very well perceive an ice machine without a pound of ammonia, but the words, "a complete ice plant," would be more effective; that takes in everything belonging to the plant, even the tools, ammonia, brine, etc. That is my opinion.

Mr. BENJAMIN: Since the insurance question has come up, I wish to state that it will afford me a great deal of pleasure to send to ICE AND REFRIGERATION, for publication, a copy of a policy that we use in Atlanta, Ga. I believe we have everything covered there that you will find necessary. I think the weak point in the policy of which Mr. Ware spoke is the sixty-day clause. If that policy has read ten days instead, Mr. Ware's friend would have gotten his money. The fact of the matter was, his friend wanted to start in right away, and could not afford to wait the sixty days, and the agent who adjusted matters just taxed him $500 for the accommodation.

Mr. FOOT: I think the point is well taken. If the man had been able to wait the sixty days, I believe he would have gotten his $4,000. That is my judgment.

President HART: Mr. Skinkle will now read a paper on the "Economy and Use of Fuels."

Mr. SKINKLE: *Mr. President and Gentlemen:* This is a paper on the "Economy in Fuels; Slack, Screenings and Duff Run of Mine or Screened Lump Coal," by Mr. W. A. Sharp, of Chicago.

ECONOMY IN FUELS.

Slack, Screenings and Duff vs. Run of Mine or Screened Coal.

The subject of fuel economy has been a thorn in the side of every manufacturer ever since he began manufacturing, no matter what the product of his factory, and it has been largely a matter of education to convince the average steam user that there is an economy in the burning of cheap grades of fuel. As a rule he buys the best type of water tube boiler, for which he pays a good price; the best type, in his estimation, of automatic engine, either simple, compound or compound condensing, according to his demands, and other machinery for the equipment of his factory of the best that can be bought; yet the very source of his expenses (the coal pile) is neglected, and for this work he will buy the same old fashion grate bar that was used under boilers fifty years ago, having given no thought to the fact that advancement along this line can have been made as well as in the line of other improved machinery.

McClave, Brooks & Co., of Scranton, Pa., some twelve or fourteen years ago invented a grate bar and blowing device for the purpose of burning the culm piles scattered throughout eastern Pennsylvania. Their idea was, and has since proven to have been correct, that in these culm piles there was a large per cent of carbon, from which, if properly used, the heat could be extracted and delivered to the boiler. For this purpose they manufactured a shaking and dumping grate, on which, when the shaking motion is used, the opening through the grate is not increased in size, and, when the dumping motion is used, the grate is turned upside down, and a series of pockets are formed, into which fall the clinker and ash usually found on the bottom of a fire. When the grate is thrown into its normal position, the contents of those pockets are dropped into the ash pit, and that much only, so that all the fire cannot be dumped into the ash pit, nor any of the unconsumed fuel, unless it is so intended by the operator.

By the use of the shaking motion, each and every opening on the entire grate surface can be moved without wasting any of the fine fuel, and, when the blower is used in connection with the grate, which is known as McClave's Argand steam blower, a pressure of air is maintained in the ash pit, and by the use of this grate the air is distributed equally over the entire surface. In bituminous coal regions much cheap coal is found, due to the demands of a particular class of manufacturers in the several localities, who demand screened lump. In districts where much of this screened lump is used, a large amount of screenings is obtainable, called by some nut, pea and slack; others, slack, and still others, screenings. This coal, as a matter of fact, contains all the nut, pea and slack coming from mines where screened lump is in demand, and this screenings contains nearly as many heat units per pound as the screened lump, and it is only a matter of how it can best be utilized.

If the ordinary appliance is used, it becomes an expensive fuel to burn, as so large a per cent of this fine fuel is worked through the grates and finally delivered to the ash pile, and called ashes, when it is not ashes, and that means the handling of a great many more tons than is necessary to do the amount of work required. While, on the other hand, if the heat contained in this class of fuel can be delivered to the boiler, better results can be obtained than by burning the lump coal. The reasons for this are as follows:

First.—With this class of fuel and a proper device, the delivery of air can be made to percolate every portion of the fire, and a proper mixture of air with the escaping gases at the proper moment can be had; while with lump coal, if blast is used, the air will circulate around the lump, and a large volume of air will be introduced to combine with a very small portion of the gases being given off by a large lump of fuel, as, in burning the lump coals, it is impossible to prevent firemen from throwing in large lumps, which is the destruction of economy, so far as the fuel question is concerned.

Second.—By using a blast and small fuel the very highest possible initial temperature can be obtained, and it must be

admitted by all that after the gases pass over the bridge wall on their way to the stack, they never become any hotter, as every influence from that point on is cooling in its effect. It must also be admitted that the hotter the gases can be started, and the greater the difference between the initial temperature of the fire and the water in the boiler, the more of the heat can thus be absorbed. When it is considered that combustion is merely a matter of the chemical combination of several gases—oxygen, hydrogen and carbon, it is only a matter of mathematical computation to find just what the percentage of each should be at a given period; and every owner of a steam plant should have in his employ some one capable of properly ascertaining these several quantities.

Furthermore, by the use of proper appliances an increased amount of fuel can be burned, and a correspondingly increased boiler capacity can be obtained.

The question is often asked of a manufacturer why he burns run of mine or lump coal. His answer will be that if he is crowded for boiler capacity with good coal, what would be his condition should he attempt to burn poor or cheap coal, such as duff, slack or screenings? Ordinarily this is a logical reply, but does not answer the question. The conditions are these: That with a draft of certain dimensions, a grate surface of certain dimensions, he is enabled to burn a certain quantity of coal per square foot of grate surface per hour, and that is his end, unless other means are afforded to enable him to increase the amount of coal consumption, which can be done in a number of ways:

First.—By increasing the grate surface.

Second.—Increasing the size and height of stack.

Third.—Introducing forced draft, either under the grates or in the stack.

In using induced draft, or increasing the stack draft, the result naturally is that more coal is burned, and the passage of the gases over the heating surface is correspondingly increased in speed; whereas, if the air can be introduced under the grates, and the damper opened just sufficiently to allow the escape of the waste products of combustion, the same amount of coal be burned on the grate surface, the heat resulting from such combustion can be retained in contact with the metal a longer period, and it is reasonable to assume that that metal, under those conditions, will absorb more of the heat than if it be allowed to travel through the tubes at the enormous rate necessarily caused by induced draft or excessively high stack. If a few of these simple thoughts are followed out, much good money can be saved in the question of fuel consumption.

Economical operation of an ice making plant must, of necessity, be dependent, to a large extent, upon the economical evaporation of water in the steam boilers, as it is admitted that a given amount of water must be evaporated in order to produce the steam from which the distilled water is condensed. In the can plant the universal practice is to manufacture the ice from distilled water, and while it is admitted that isolated plants are in use, on which compound condensing engines are operated, with a view of realizing the greatest possible power from the least possible expenditure for fuels, it has not been demonstrated that there is any economy to be derived from the use of compound condensing engines in connection with machines for ice making purposes only. In fact, it is a well established fact that a good Corliss engine will not require sufficient power to produce the requisite amount of distilled water necessary for ice making purposes; and where such engines are in use in connection with ice making plants, it is the almost universal custom, brought about by necessity, to carry live steam from the boilers direct to the steam condenser in order to make up the deficiency in distilled water from the exhaust steam. It will readily be seen, therefore, that the efficiency of evaporative effect in the steam boilers is the key note of economy in the manufacture of distilled water ice. To give my hearers an idea of the relative economy of high grade and low grade fuels, or, more accurately speaking, high priced and low priced fuels, I would offer the following comparisons, from data on the subject under discussion. Let us assume that a given mine will guarantee their coal to produce an evaporative effect of eight (8) pounds of water per pound of coal burned, under ordinary tubular boilers, and using straight grates, but that the same mine will not make any guarantee whatever regarding efficiency of their slack coal (which we find to be almost universally the case, owing to the fact that the mine owners appreciate that slack fuels cannot be effectually burned on the ordinary straight grates without the utmost labor in keeping the fires cleaned and the grates open to the admission of air). Let us put the cost of the mine run coal at $2.35 per ton of 2,000 pounds, and the evaporative efficiency at the amount nominated, eight pounds of water to the pound of coal consumed, and compare this with slack from the same mine, at a cost of $1.25 per ton of 2,000 pounds, and an evaporative efficiency of only six pounds of water per pound of coal burned, which would be an average result. I shall put the comparison in terms of tons in each instance, as the "ice man" is doubtless better pleased with calculations based on tons rather than pounds. We will assume that it is desired to evaporate forty tons of water each twenty-four hours. On this basis we would require the following quantities of fuel, at the prices named, and our relative evaporating cost would be as follows, viz.:

	Cost per ton
Five tons coal at $2.35=$11.75, at 8 to 1-40 tons water,	$0.2937
6⅓ tons slack, at $1.25=$7.91, at 6 to 1-40 tons water,	$0.1978

The above example would show that the evaporative effect with the higher priced fuel would cost about 50 per cent more than the same effect with the lower priced fuel, and it will hold good in any case where the prices range in proportion to those above quoted.

The paper was applauded.

Mr. SIEBERT: There is one clause in this article about the saving of fuel in connection with an ice machine, that I take exception to, because it is not possible to do so. Mr. Busch has an ice plant in St. Louis, where he uses compound condensing engines and makes 220 tons of ice, and uses originally 150 pounds of steam, using an evaporator with an expenditure of fuel, 15 per cent. The fact is this. A 100-ton ice plant can be worked with about sixty pounds of steam, using the steam from the boiler in the re-evaporator. Say the steam has a pressure of 175 pounds; this steam is in a kind of heater and is used to evaporate water at 125 pounds pressure. The total heat is so little different at 175 pounds that it is almost the same amount of steam; consequently an open condensing engine will furnish you from sixty pound of original steam, with 100 tons of condensed water, and that is about the limit of a compound condensing engine. Of course, when it is expedient, an extra evaporator must be furnished. He uses the exhaust and loses fifteen inches vacuum. Of course it increases the fuel 15 per cent. The live steam costs you 3 per cent. It is better to use the live steam than to use the exhaust for that purpose. It can be done, for as I say, Mr. Busch has done it.

Mr. SKINKLE: I would like to ask Mr. Siebert if Mr. Busch has not abandoned the triple evaporator he had in use.

Mr. SIEBERT: No, sir, he has not done so. He has 15 per cent loss because he has fifteen inches vacuum. The difference is so little between 125 and 175, and that is where you have a great advantage. A temperature of 340° makes that with the second condenser about 140. You get it condensed at 240. You not only get the water at 212 instead of 140 as you do in the ordinary way, but you get the reboiling for nothing. With the super-heater you can superheat your steam, and the second advantage is this, you have no primary at all, because the second evaporator is so little different; it has all the advantages.

Mr. SKINKLE: Your plant in St. Louis, the Mound City Ice and Cold Storage Co., is both ice making and refrigerating at the same time. Would you recommend the same practice in the ice making alone as you do in refrigeration?

Mr. SIEBERT: I must have a re-evaporator absolutely. You will then make your ice with one pound of coal, about twelve pounds of steam per horse power. We have 26-inch pipe, and we make 120 tons of ice; have more than enough for that.

Mr. SKINKLE: You get down to twelve pounds per horse power, you won't have sufficient horse power to run that plant with; consequently you must take your steam from the boiler.

Mr. SIEBERT: That's it, exactly. We have two 200-ton machines. The other 200-ton machine, the steam of which is used for making ice, is simply used for refrigeration. It don't cost us a cent to run the other 200-ton machine.

Mr. SKINKLE: It would not do that without a

re-evaporator. I think Mr. Sharp's point is well put. There is considerable economy in considering the expense required for equipping the plant with the necessary appliances to do the work.

Mr. SIEBERT: It will cost more than 25 per cent, but if it cost me $2,000, and I could see a saving of 50 per cent, I think it is good enough to have.

President HART: Mr. W. H. Howe, of Nashville, Tenn., is traveling around the world. I have a letter from him, which the secretary will please read.

Secretary Worth then read the following:

LETTER FROM MR. HOWE.

THE NAGASAKI HOTEL, LIMITED,
NAGASAKI, JAPAN, December 20, 1899.

LOUIS P. HART:

Dear Sir.—I am this far on my way around the world. Will sail to-night for Shanghai and Hong Kong, thence to Singapore, Calcutta, Bombay and Cairo, Egypt, etc.

Will not be home until middle of next summer; consequently I will not be able to be with you at the meeting of the Ice Exchange, which I very much regret. Please present my compliments and best wishes to my brothers of the Exchange. I hope they have made money enough the past season to enable them to spend the winter on the Nile, and that they will make enough next season to enable them to retire as millionaires.

Yours very truly, W. H. HOWE.

The reading of the same elicited applause.

Mr. LEARNED: Did he make this money out of the ice machine business, that he is traveling on?

President HART: He did.

President HART: Mr. W. W. Sumner has a paper to read on "Insulation."

The paper read by Mr. Sumner was as follows:

INSULATION.

The subject of insulation of heat is one of supreme importance to manufacturers of cold, or in other words to ice manufacturers, and as it is a subject very new in application to business, it is often misunderstood, and the true principles underlying the construction of insulating materials entirely overlooked.

The terms of conductor and non-conductor in heat insulation are purely relative ones, as every substance in the world conducts heat, although the degree of speed at which two different substances conduct is very marked; hence the one which conducts heat rapidly is called a conductor, and the one which does not conduct rapidly is called a non-conductor. Now, it has been found that heat conduction in different substances rises with the density. The greater the density the greater the conductivity, and vice versa; the more porous a substance the slower is heat transferred through it; hence it is proved that air is a relatively poor conductor. From this fact it might be, and often is, assumed that to build an air space is all that is necessary to thoroughly insulate a body. This, however, is not true, for air transfers heat from a warm object to a cold one by convection or the flowing of currents, which carry the heat from one wall of an enclosed space to another, thus facilitating the transfer and rendering air when *free to move* a poor insulator rather than a good one.

To illustrate our point we have a small apparatus constructed with a view to showing the rapidity with which heat is transferred across an open air space. By placing a small air vane or windmill in an inclosed space, and cooling one wall with a cold water jacket and heating the opposite wall with a hot water jacket, a current is set up strong enough to overcome the friction and actually set the vane in motion. Although the speed of circulation is much retarded by the wheel itself, yet it is obvious that even if the speed were exactly that of the rotation, the transfer of heat from one side to the other is much faster than is ordinarily supposed.

Under what conditions, then, is air a good insulator? If air is confined in any body in such minute spaces that currents are impossible, or, to speak correctly, are so often interrupted by cell walls or particles of the body, that the carrying of heat by them is exceedingly slow, then the air is in such disposition as to prove of great value as an insulator, and any body which is so constituted as to have a vast quantity of minute air spaces, often called dead air spaces, is a superlative non-conductor of heat. Now, given the truth that minute or exceedingly small air spaces are necessary or advantageous to an insulator, let us turn to the question of what influence the character of the material which confines the air has upon its value as an insulator.

Mineral matters are to be avoided as being too dense, even when much subdivided, thus tending to conduct heat, and also as the fine particles are brittle and liable to disintegration and settling from position. Animal matter is very liable to decay, both wet and dry, and attack by vermin, so that it is not to be recommended for the purposes under discussion. The writer after careful study has determined that if the particles making up an insulating body are flat tissues occupying in themselves a small space, they thereby allow the greatest number of cell walls to intercept the flow of the minute currents of air which carry the heat, and thus produce a material constructed on ideal principles for the non-conduction or insulation of heat.

In examining a large number of materials the one approaching nearest to the ideal composition and construction is a vegetable material derived from the sea and commonly called eel grass, though the botanical name is *Zostera marina*. It is distinct from the sea mosses. It contains very little of the carbon compounds of ordinary air plants, but seems to be of a siliceous character and has been found by the author to combine more of the qualities necessary for a non-conductor than any other substance. The saline character, combined with the silica of its composition, renders it non-combustible and repellant to vermin, while there being no sappy matter, there is no chance of decay, and the flat fibers are eminently suited to provide, when tightly packed together, the vast quantity of minute dead air spaces which are essential to a good insulator. An old house in New England, built in 1635, was found well protected against cold by a layer of this eel grass, which was in perfect preservation when examined two years ago.

In insulation work it is advisable, after choosing a thick, soft, porous material, to so construct the building, whatever it may be, as to save space and cost in construction. Pains should be taken, especially where cold is artificially produced, to prevent the condensation of moisture in the insulating material, and to this end it is well to confine the insulation between walls as nearly air tight as can be made, with resin sized paper and matched boards. For example, in ice house construction the studs may be covered on the outside with a layer of matched boards, against which the insulating medium can be nailed. This is then covered with air tight paper, which is in turn covered with another layer of matched boards.

In conclusion we have to say, that elaborate construction is unnecessary if a good thick, porous insulating material is used, and one which will hold together when in place, and will not easily disintegrate and sift down into dust. The insulation should be held firmly between two air tight surfaces. In this way both efficiency and economy are secured.

The paper was well received.

President HART: I wish to announce at this time that there is a trolley ride at 3 o'clock this afternoon, and a banquet at 9 this evening. I have been asked by several of the members about the Mardi Gras in New Orleans. For their information I will say that I will telegraph to New Orleans, and have my clerk secure a list of the rooms for the benefit of any of the members and their ladies who contemplate going to New Orleans. I will have a list at the depot, where they can go and secure their rooms.

This announcement was received with apparent pleasure by the delegates.

President HART: Mr. Rushton has a paper to read on "One Hundred Years from Now," which was prepared by Mr. F. W. Niebling, of Cincinnati. Mr. Rushton then read the following paper:

ONE HUNDRED YEARS FROM NOW.

The subject is indeed wide in its scope, and leaves a vast field for the imagination to rove in, with no obtrusive limits, and no warning placards: "Thus far, and then you stop." The future is all our own, to do with as we please, and no flight of the imagination can picture the century to come in colors so vivid as to be impossible, for who, 100 years ago, would have believed the theorist who described in glowing terms what to us to-day are absolute necessities: Our system of railroading, the wondrous cable, telegraph and telephone "tell-a-woman," the wonders of ice and refrigerating machinery, and electricity, with its wonderful feats.

The eighteenth century was presumably a season of inquiry, and they who stood on the threshold of the nineteenth expressed astonishment at the progress made, and remarked that at no period of the world's history had there been gathered such a wealth of knowledge in all the diversified branches of science, art, letters, and last, but not least, engineering. Never before had there been such liberal contributions to light, knowledge, refinement and the development of the industries.

The nineteenth century has been characterized as a period of miracles. The repeated succession of discoveries in every department of human activity has astonished the world. Our population in 1800 was 5,308,483. It is now 75,000,000, and at the close of another century will probably be 500,000,000. The methods of work and study have been revolutionized. It seems

almost impossible to realize the transformation of conditions from the beginning to the end of the nineteenth century.

"Yet I doubt not through the ages one increasing purpose runs,
And the thoughts of men are widening with the process of the suns."

Refrigeration and the manufacture of ice has now spread from sea to sea, and our own beloved land, the grandest of them all, holds on high the torch of genius, the guiding star for nations far and wide. And now, as we lift the veil of the uncertain future and contemplate the marvelous possibilities, we are taken out of the cavern of hidden truth, "Long lost, but now found"; and with "renewed vision" "we see the evening beam that smiles the clouds away, and tints to-morrow with prophetic ray."

From the massive towers of 1999 let us take a survey of our surroundings, for the health department has so purified the air, that our range of vision is limited only by the coast line of the continent, where the ocean stretches away in one vast, beautiful expanse of blue. The hills and mountain ranges have disappeared, and the valleys have been filled up, the rivers straightened, and the great lakes sterilized, and the fish vaccinated. Bassler's adjustable meteorological chronometer, warranted not to rip, split, burst or blow up, is hung along the forty-fourth parallel of latitude at intervals, temporizing the weather, and regulating the humidity and the rainfall. Nothing else could account for the luxuriant foliage, the abundant soil products, and the beautiful and fragrant flowers. Mr. Always-right, the new man in charge of the weather bureau, is prepared to furnish all kinds of weather, upon twenty-four hours' notice, for elections, wedding parties, Sunday school picnics, and the southern ice conventions. It is impossible to even mention in this limited time the great number and variety of industrial and mechanical developments. But follow me to the new shops, where all the work is done by the pressing of electric buttons. The bookkeeper no longer bends over his desk at all hours—long columns of figures are now footed by the machine in the office, and another shows all accounts balanced and guaranteed to be correct, and there is no longer any disappearance of the cashier with a wealth of funds at his command. The stenographer, too, has vanished, and her place is supplied by the little machine, which is neat, correct and swift as the wind. But come with me to the refrigerating department. The manager has touched the button, and the place is beautifully lighted and looks like a fairy realm, with its beautiful white tile floor, and clusters of frosted pipes, and the swiftly whirring but noiseless machinery. Then the great cakes of ice are lifted out, dumped, stored, and the cans refilled as if by magic, for no one now has to attend to this—it is done automatically. The great engine and boiler need no watching; the fire feeds itself, and everything about the beautiful room is warranted unbreakable, while Mr. Take-it-easy, who, in the nineteenth century, would have been called the engineer, but is now the partner and co-worker with the president and other members of the great company, walks around with his hands in his pockets, smoking three for-a-dollars, and seeing that no flies put in an appearance in his finely furnished quarters; for with all the wonderful improvements of the day, the genius has not yet appeared who has succeeded in doing away with this little pest.

Strolling along the wide avenues, one is agreeably surprised at the quiet and cleanliness of everything; but the guide soon explains, in a voice toned down to perfect harmony, that all the machinery and all the means of traffic are now perfectly noiseless, and all waste matter from the factory, the house and the streets is taken up instantly, and forced by the upper currents of air, now under complete control, into tubes and carried to the north pole, or cylinder, where it is being utilized to fill the caverns of the earth, to prevent the accumulation of gas, that by explosion caused so many earthquakes in the nineteenth century.

The fondest dream of the socialist has been realized in the multiplying of cities and the reclaiming of waste land for agricultural productions. The distribution of population has been scientifically adjusted, and human rights, privileges and blessings equalized and amicably arranged. Mental telegraphy is an improved and perfect scientific reality. The banker and the farmer have the same business and domestic enjoyments, and by adjusting the vibrations of their communicators may talk business or pleasure. In the vast northwest there are great stretches of ripe grain. The inventive genius of the twentieth century man has so constructed machinery, by the aid of electricity, that planting, cultivating and reaping are done without waste of muscle. The thrifty farmer sits in his library reading the old historical works of Bellamy and Jules Verne, and wonders that people could have been so incredulous as to consider them all a dream. The wireless telephone repeats audibly an order for 1,000,000,000 bushels of grain. He touches a button and the pneumatic tubes are connected with the Transvaal. Again he touches a button, and the ponderous harvesters move out into the field, cutting, threshing, cleaning and marking C. O. D. the yellow corn as it is deposited in the tube to be poured forth into the cornucopia of the emperor of South Africa, to be ground by the new diamond process, and distributed throughout the world.

But let us look upward! The development in eyes has brought other worlds within the radius of our sharpened vision. Venus, Mars, Jupiter and Mercury interchange with our planet their views on all the leading questions of the day. The wireless telephone has been so perfected that vibration may be answered by vibrations in other worlds. We add to our advanced civilization the civilization of Mars in the use of artillery which fires without guns, the ponderous machinery of Jupiter, which hurls great thunderbolts into space, are photographed on the sky, called up to vision by a touch of a button. From Venus we have been taught the highest ideal of domestic felicity, unmoved by any friction or disturbance; from Mercury we learn lessons of rapid transit.

We can talk with these people, as our ancestors of the nineteenth century talked with their neighbors. We can speak to millions where they could then have spoken to but one. Not only has our range of vision attained marvelous perfection, but the brains of men have become so purified, strengthened and concentrated, that every human being fully understands and absorbs the teachings and truths of those under whose influence they come. A plan is now under consideration for an interplanetary alliance, and the agents of neighboring planets have about completed the appliances by which the instantaneous transmission of mails and parcel packages may be made from planet to planet.

The torrid and fierce heat of the equator is now tempered and made delightful by the waves of cool air wafted from the poles, so perfect in temperature and so delightfully fresh, as to make life one long happy dream.

Then the dreadfully mischievous small boy has disappeared altogether—no more broken windows, flying stones, abused dogs and cats or missing fruit and edibles. The small boy of to-day is like to the Bostonian of the nineteenth century, always grown up. All over the vast domain are millions of human beings, the best type of cultured manhood, a composite of the best blood of the nations. Born on our native soil, educated in our public schools, trained in our shops and each having a certificate of moral character, showing eminent qualifications, by labor and study, to take part in any football, baseball, tennis or golf contest, or enter any other field of human activity or industry.

The system of refrigeration is now so perfect that the fish are frozen right in the water, as part of the lakes, rivers, bays, etc., is now refrigerated, and no fish storage houses are now necessary. All the cities furnish distilled ice water from the reservoirs during the summer, and for drinking purposes in the winter, while the water for general supply during the winter is furnished hot, gratis.

People no longer flee to the north and the great lakes for their summer vacations. The air ship is now in demand, and in these spacious, airy and luxurious palaces they float about for months among the clouds, greeting, visiting and enjoying their neighbors' airy homes as much as their ancestors of the nineteenth century enjoyed their summer cottages at Newport, Chautauqua, Old Point, etc.

The firms of the present day are all reliable—really so, not like some of their predecessors of a century ago, of whom Mrs. Smith purchased a barrel of flour. After taking out two bakings she found it to be no good, and returned it at once. The reliable concern refilled the same barrel and sent it to Mrs. Smith. After a few more bakings out of it, she found upon investigation that it was the same barrel, for she found her scoop in it. She immediately went to this reliable firm, and informed them that they had sent her the same barrel, but the manager said: "Impossible, madam; a reliable concern would never think of such a thing, and we are certainly sorry that you would even think that we could misuse a good customer like you in that manner." Just then Mrs. Smith produced the scoop, which had been left in the barrel. Draw your own conclusions.

But I must close. It is not wise to lift too high the veil of the future, lest the shock be too great, leaving some in such a mental condition as to produce infelicities when they reach their hotel at a late hour, and meet the anxious spouse who is not under the same inspiration, nor wrought up to the same scientific tension.

The paper was greeted with great applause.

Secretary Worth then brought up for discussion the question of the differences between the small and large ice manufacturers, and asked for instructions and suggestions as to the best method of handling these difficulties, and also sought ideas of how best to induce all ice manufacturers to join the Association.

Mr. Rushton: In the state of Alabama there is one place that has complained very much against a larger place. The factory that was doing that shipping was not a member of the Exchange; had been a great number of years ago, but had dropped out. It has been the endeavor of the Exchange to try and get these parties to come in, and so we said to them: "Come down and talk to the people, ascertain the different ideas we have, and very possibly we may harmon-

ize; if you can't it will be your own lookout." I thought possibly the friction between them might be lubricated a little, and it would help out. And so we endeavored to get them in. I believe it would pay the ice makers of this country, for the right man to be picked out of this Exchange, to have him go round and visit the people, not as an evangelist, to convert the world, but to get around at about the right time, and see if we cannot induce these people to come in with us. I think this would relieve a large portion of the friction that now exists.

Mr. BENJAMIN: I, for one, have never been willing to ship ice into other cities as long as those cities had plenty of ice to supply.

Mr. RIGGS: This association is trying to harmonize the interests of thirty or forty cities. This question is too vast to settle in a moment. As we modified our by-laws to give each state a representative on the executive committee, it ought to be left to that committee. You have to approach this question locally. For the benefit of the association I want to state my experience in our state for one year. I worked on two different occasions to arbitrate difficulties of this kind. These are all local difficulties that could very well be left with clear headed executive members of the board, such as we usually have from each state, and it is not proper to come up at this meeting. It is not possible for a man at Mobile to prescribe good medicine for a man at Chattanooga. These people can get together and arbitrate; no other way.

Mr. RIEKE: Suppose a manufacturer has sold twenty tons in a town, and he shipped the first car of ice ever sold in that town. He has the ice trade, and a man goes to work and starts up a factory in that town. Ought that first manufacturer to cease shipping ice to that town?

Answer.—No.

Mr. RIEKE: We have always made it a rule not to ship ice in a town where there is a plant; that is a rule we have always lived up to. And I will say this, as a member of the Southern Ice Exchange, we have favored the small man every time. We do not ship in his town as long as he acts fair.

Secretary WORTH: Last spring, after going home from Chattanooga, I found a letter from one of the ice manufacturers asking me if I would not try and adjust a difficulty between himself and neighbor, neither of them being members of the Exchange. So I sat down and addressed a letter to every man in the ice business in North Carolina, and asked them if they were willing to meet me at Goldsboro, together with the other manufacturers of the state, with the idea of adjusting the difficulty. I got them all there with one exception. We settled the difficulty in twenty minutes.

President HART: In regard to this discussion, I think this article of the constitution covers the whole ground, and the secretary will read it.

Secretary Worth then read article II of the constitution as follows:

OBJECTS OF THE EXCHANGE.

The Southern Ice Exchange is established to secure co-operation among the ice manufacturers and allied industries, in furthering and protecting their interests, general welfare and prosperity; to encourage and forward in every way all improvements in the manufacture and handling of ice, and to gather and disseminate practical and useful information relating to the ice manufacturing business. Also to promote social intercourse among the members of the Exchange, cultivate friendship and good will, encourage all good qualities of head and heart, and keep good fellowship among all its members.

At the conclusion of the discussion Mr. Riggs moved that the secretary indicate to the several gentlemen who furnished the papers already read, and also to the gentlemen who read them, that the thanks of the association be extended to them. [Motion prevailed.]

Mr. RIGGS: I believe it is the usual custom, and I will make a motion, that a committee of five be appointed to nominate officers and report at the convention to-morrow morning.

The chair then appointed Messrs. Riggs, Lyons, Lapham, Hancock and Kellar as members of said committee.

The meeting then adjourned until 10 o'clock Saturday morning.

TROLLEY RIDE.

At 3 o'clock in the afternoon of the 23d the delegates attended a trolley ride throughout the city and suburbs. The start was made from near the Battle house, and the run was made to Spring hill, some seven miles, after which Monroe park was visited. The opportunity was thus given of obtaining a very comprehensive idea of Mobile, and the ride was greatly enjoyed by all.

THIRD DAY'S PROCEEDINGS.

The convention re-assembled at the German Relief Association hall, at 10 A. M., for the conduct of business, President Hart presiding.

President HART: We have received twelve more letters from members of the Exchange, who regretted exceedingly that they could not be with us on this occasion. I will not take up your time by having them read, but will request that their names be published in ICE AND REFRIGERATION:

The following are the names referred to:

Sidonius Goethe, Donaldsonville, La.
C. D. Wingfield, Richmond, Va.
M. W. Thompson, Greensboro, N. C.
W. E. Wood, of Wm. T. Wood & Co., Arlington, Mass.
J. M. Allen, president Hartford S. B. I. and I. Co., Hartford, Conn.
Sterling R. Holt, Indianapolis, Ind.
E. Arnoldi, Sherman, Tex.
Satilla Manufacturing Co., Waycross, Ga.
Madison Cooper, Minneapolis, Minn.
J. A. Mermelliot, Port Gibson, Miss.
H. D. Stratton, Philadelphia, Pa.
Samuel Cabot, Boston.
F. W. Niebling, Triumph Ice Machine Co., Cincinnati, O.

President HART: We will now have the report of the executive committee.

Mr. Rushton then read the following report:

REPORT EXECUTIVE COMMITTEE.

The flourishing condition of the Exchange is shown by the secretary's reports, and the increasing number of applications for membership.

Total number of members			182
Dues unpaid	21		
Resigned or gone out of business	23	44	138
Honorary members			7
Associate members			41 186

The officers have thoroughly performed their duties. It is known to each committeeman that the secretary has communi-

cated with each manufacturer of ice in their respective states, and that there have been made by him strenuous efforts to have all attend this convention. The committee has but one recommendation to make, as follows:

"As a memento of this pleasant meeting, we recommend that the secretary furnish Mr. Lyons, the chairman of the local committee, a complete list of the membership, with their addresses, now on our membership roll, for the purpose of sending by express, to each member, one of the photographs taken here yesterday. It will gladden them that enjoyed this meeting, and act as an incentive to the absent ones, to be with us next year; the cost of same to be paid out of the funds now in the hands of the treasurer."

Signed, W. J. RUSHTON, *Chairman.*
SOL BENJAMIN.

President HART: You have heard read the report of the executive committee. What is your pleasure?

Mr. WARE: Move that it be received and the recommendation adopted. [The motion prevailed.]

President HART: The auditing committee report is in order.

Mr. RIGGS: Mr. President, your committee has examined the books of the secretary for the past fiscal year, and find the same to be correct. The amount of money on hand the beginning of last fiscal year being $1,164.97, while the amount on hand at this date is $1,711.08. We recommend that the secretary, Mr. W. E. Worth, draw from the treasury the sum of $150, for services as secretary.

Signed, L. C. RIGGS, *Chairman,*
LEON BERTON,
FRANK O. RETTIG. } *Committee.*

President HART: You have heard the report of the auditing committee. What is your pleasure?

Mr. WARE: I move you, Mr. Chairman, that the report and recommendation be adopted. [The motion prevailed.]

Mr. RUSHTON: Captain Whiteside is here, the chairman of the monument committee, and I would recommend that the Exchange allow $103.74 to Capt. George Whiteside for the final payment on the monument. These expenses have been paid by Captain Whiteside as chairman of that committee, and I desire to say right here that the chairman alone has done all the work. The committee beg pardon for their negligence in the matter, but they had a good chairman, and they let him work.

Mr. KELLER: I move that the recommendation be received and the report adopted. [The motion prevailed.]

President HART: Report of the nominating committee.

Mr. RIGGS: Mr. President, the nominating committee desire to report that after considering the various offices for the numerous members, they take pleasure in offering the following ticket:

For President: W. J. Rushton, Birmingham, Ala.
For Vice-President: W. S. Ware, Jacksonville, Fla.
For Secretary and Treasurer: W. E. Worth, Wilmington, N. C.

EXECUTIVE COMMITTEE.

Samuel Lapham, chairman, Charleston, S. C.
A. S. Lyons, Mobile, Ala.
J. R. Keller, Pensacola, Fla.
Frank O. Rettig, Memphis, Tenn.
Sol Benjamin, Atlanta, Ga.
B. F. Learned, Natchez, Miss.
Frank N. Rieke, Paducah, Ky.
Leon Berton, Helena, Ark.
C. D. Wingfield, Richmond, Va.
M. W. Thompson, Greensboro, N. C.

President HART: The election of officers is in order.

Mr. BENJAMIN: Before you go on with the election of officers I desire to present this resolution:

Resolved, That the Southern Ice Exchange, in convention assembled at Mobile, Ala., February 24, 1900, appreciating as they do the many courtesies and generous hospitality of the committee of arrangements and reception committee, tender to them our sincere thanks and assurances that in years to come we will with pleasure recall the happy hours spent with them in the city of Mobile. Recognizing the untiring efforts of the chairmen, Messrs. A. S. and Pat. J. Lyons, we extend to them our especial thanks. Thanks are also extended to Mobile Lodge, B. P. O. E., No. 108, for their kind invitation to meet with them at their stag social session, congratulating ourselves with them, but compelled to leave the lodge room before 5 A. M. The local press, as well as the *Times-Democrat*, of New Orleans, is gratefully remembered for the many attentions shown us. Coming here with minds surcharged with thoughts of frost and ice, and meeting hearty grasp and cheery words of welcome nice, we part with hopes that we again may meet, acknowledging that we have surely had a treat.

President HART: You have heard the resolution as set forth by Mr. Benjamin. All in favor of it say aye.

President HART: Unanimous vote.

President HART: The election of officers is now in order. If there is no objection the rules can be suspended and the secretary instructed to cast a ballot for the gentlemen nominated.

Mr. Keller moved that it be done. The motion prevailed.

Secretary WORTH: On behalf of the Exchange, I hereby cast the ballot for the entire ticket, and declare them duly elected.

Ex-President HART: Mr. Rushton, it gives me great pleasure to inform you that you have been elected president. They have made a very wise choice. Mr. Rushton, you will please take the chair.

President RUSHTON: *Gentlemen and Members of the Southern Ice Exchange:* It is one of the greatest treats of my life to be placed in this position, and I assure you that in the usual order of things I will try to do what is right. Should I, however, run against any of you, you will know that you are in the wrong. We trust to run the Exchange in the future as the retiring president has done in the past. I thank you.

Secretary WORTH: I have just received the following telegram from Prof. Siebel, of Chicago, Ill.:

CHICAGO, ILL.

SECRETARY SOUTHERN ICE EXCHANGE, CONVENTION ROOM 16, BATTLE HOUSE, MOBILE, ALA.:

Much success to your deliberations and exercises; sorry cannot be with you. J. E. SIEBEL.

President RUSHTON: Is there any business to come before this meeting?

Mr. RIGGS: I notice in the first issue of ICE AND REFRIGERATION a very kind reference to Mr. David Boyle, and I know of a young man who can give us some idea of the services rendered by that gentleman. I move you that Mr. Skinkle be requested to make a few remarks.

Mr. Skinkle was not present.

Mr. KELLER: I take the liberty of apologizing to our secretary, Mr. Worth, for not answering his communication. It seems to me that where a man sends out 170 letters, as our friend Worth did, and in return receives only seven replies, six of which are from associate members, that it evinces a lack of appreciation; and for myself I desire to say that for the future I will do better, and I hope others will.

President RUSHTON: I trust that the report of the secretary will touch the heart of every member of the Association in the same way that it has done Mr. Keller.

Ex-President HART: I wish to announce for the benefit of the members of this Exchange who intend going to New Orleans, that an extra coach will be attached to the 2:15 train. Wish also to announce that ten rooms have been secured at reasonable rates at 834 St. Charles street. If the members who are going will let me know what they need in the way of rooms, I will telegraph for them and secure the rooms.

President RUSHTON: All those members of the Southern Ice Exchange in good standing who have paid on account of the picture will give their names to Mr. A. S. Lyons, and they will have the money refunded.

Mr. WARE: It has been suggested by our honored friend, Mr. Atwood, that Mr. Skinkle be permitted to print his eulogy on David Boyle, and have the same embodied in the report of this meeting. I make that in the form of a resolution. [The motion prevailed.]

Ex-President HART: I want to read some poetry for the benefit of the Exchange. It came to us in our mail.

Well! you deserve
The prize for nerve,
O cheekiest of men!
To offer ice
At any price,
In this cold weather, when
Each morn to me
It cometh free—
The pitcher holds a chunk,
The bowl is "froze,"
The gutter shows
A most gigantic hunk.
Our cisterns stop;
There's not a drop
Of water we can get
Until, O Lord!
The faucet 's thawed
With water warm—and yet
The postman brings
The inclosed things
Which you have sent to me—
Why should I pay
For ice, I pray,
When I can get it free?

President RUSHTON: The selection of the next place of meeting has not been left to the executive committee. Will you accept invitations for it now?

Mr. LIVINGSTON: I move that invitations, if any, for our next place of meeting, be now received.

President RUSHTON: I want to extend to the Exchange a cordial invitation to visit Birmingham. We have not as large a water space as Mobile, but we have many pleasant sights, steel mills and other industries, not to speak of the mountains, and I know your visit will do lots of good to the Birmingham people, and I offer Birmingham as our next place of meeting to the Exchange for its action.

Mr. ATWOOD: In regard to this meeting, it has been suggested to me, by several of the members, the advisability of considering whether November would not be a better time for us to meet than the spring. I thought it would not hurt to bring the matter up. With me it don't make much difference.

On motion, Mr. Rushton's invitation was accepted.

Mr. RIGGS: I think it inadvisable to change the meeting time. I think it ought to be in the spring, as heretofore.

President RUSHTON: What is the pleasure of the Exchange? Let it go to the executive committee, or take the matter up now?

Mr. RIGGS: I move that the time for the meeting be left to the executive committee. [The motion prevailed.]

President RUSHTON: The secretary would like to get some kind of a promise from the members, that during this new year that we have just entered upon, they will not wait on his motion in regard to getting up interest for the next convention; that they will not wait to receive word from him, but that they on their own account will drop a line to their near neighbors, and thus try and arouse some enthusiasm in them, and try and get together a big crowd at Birmingham next year. Remember that last year he only received seven replies after writing 170 letters. Try and do better this year. We ought to have at least 75 per cent of our membership at these meetings, and we can do it if every one will do his part.

Mr. LEARNED: I have a suggestion to make right on this proposition. I belong to another organization, and the way we do in that, the secretary furnishes us with printed typewritten circulars, each containing a list of all the members of the organization, with a check opposite the names of those who attend the meetings, leaving the coast clear for us to get after those who do not attend. And the way we work it is this: Each member is supposed to look after those delinquents in his own vicinity. I think something of the sort could very well be put in practice with the Southern Ice Exchange.

Secretary WORTH: I am very glad that Mr. Learned has made that suggestion. I thought of the same thing last summer, and started to do it, but I really got so busy that I did not have a chance to put it in practice. I will say in this connection that I have a very complete list of all the ice manufacturers in the southern states, so that we will have plenty of material to work on. I shall follow out that idea and send a list of all to the members, indicating those that are in good standing. I think the suggestion a good one. Another thing: I will be very glad if, during the summer months, you will jot down topics of subjects that you think will make papers of interest for the Exchange. I went back over the pages of ICE AND REFRIGERATION for many years, and I found it extremely difficult to pick out a subject that had not already been treated fully.

President RUSHTON: It is not necessary to make a motion along the line suggested by Mr. Learned, as the secretary has already been working on that basis.

Mr. BERTON: I just want to state that I shall oppose any change in time of meeting. I will do everything I can to help the organization from any standpoint, but I cannot attend the meetings if the time of holding them is changed.

President RUSHTON: Mr. Berton failed to state just why he could not attend. I will tell you. A great many ice manufacturers in the south are engaged in

other businesses as well, and when they are not doing much in the ice business, they are pretty busy with cotton, etc. I think with him that the time should not be changed.

Mr. FOOT: I am with Mr. Berton on this. A great many of us are engaged in other businesses, and November is our busy time.

Mr. ATWOOD: My suggestion in the matter was only theoretical. It is just as easy for me to come in February as it would be to come in November. My only desire is to get a larger attendance.

Mr. LEARNED: The month of February is usually the slackest time with all business men, and I think most of the members will know what grievances they have, and what suggestions they want to make better in February than they could in November; because with November the rush of the closing business of the year is upon them, whereas with February, one year is done with, and the business of the other year is not yet started. Make it February.

Mr. LYONS: I would like to state that the Exchange has been invited to the brewery for luncheon. The ladies are preparing to go at 11:30 by omnibus; the gentlemen can go by trolley car if they so desire, special cars will go there.

Mr. LAPHAM: I move we now adjourn. [The motion prevailed.]

The Southern Ice Exchange then adjourned to meet next year in Birmingham, Ala., 1901.

VISIT TO MOBILE BREWERY.

After the adjournment of the final session of the convention, the delegates and ladies visited the Mobile brewery at the invitation of the committee of arrangements and the brewery company. Transportation was furnished to the brewery, where the delegates made a thorough inspection of the brewery premises, as well as the plant of the Mobile Ice Co., located across the street from the brewery.

Luncheon was served in the ice plant, and the celebrated "Mobile Purity" was served to all, and was much enjoyed.

At the conclusion of the luncheon Mr. Rushton, on behalf of the Chicago delegates, read to Mr. A. S. Lyons, the chairman of the committee on arrangements, the following testimonial of their regards, which was signed by all the Chicago delegation.

MR. A. S. LYONS, CHAIRMAN COMMITTEE OF ARRANGEMENTS:

Dear Sir.—In behalf of the Chicago delegation to the Southern Ice Exchange, we desire to express to you, and to the good people of Mobile, our appreciation of your hospitality. Southern hospitality is proverbial throughout the civilized world, and the hospitality that we have enjoyed at your hands has convinced us that Mobile is positively the fountain head of hospitality and courtesy. Our comfort and entertainment has been so complete that no detail could be added to make our enjoyment perfect. Long will old Mobile remain a pleasant memory to all of us. We thank you in sincerity.

Mr. Lyons responded as follows:

Mr. Rushton, Ladies and Gentlemen: I can only say that this is somewhat of a surprise to me, and it is very good of you to be so courteous and so heartfelt in your thanks. I think the greatest pleasure one can have is to please others, and see that they are pleased. This has always been the great aim of my life. It gives me great pleasure to know that the people from Chicago appreciate what little I have done, and I hope they will come back again soon. I thank you.

The Hon. Mr. Robinson looking in at this juncture, Mr. Lyons called on him to say a few words.

Mr. Robinson spoke as follows:

Ladies and Gentlemen: It seems to me a little unfair before a person gets well into the room, and has an opportunity to look about, to jump right on him for a speech. I was wondering when I came in here over two very puzzling propositions. First, What time the Ice Exchange could find for the transaction of business, and the second was: How they could possibly transact business when they found the time?

Last night the members of your Exchange were indulging in various beverages, sherry, white wine, claret, cognac and champagne, and to-day I find them with their glasses filled with "Mobile Purity." I have understood, gentlemen, that it is a wonderful soberer up, and I recommend it to you all. It is an institution of which Mobile is justly proud. From its action it is calculated to repair the human system and build up the physical man. It is soft as a memory of buried love, pure as prayer which childhood wafts above. Engineered, directed by that vast genius of business, A. S. Lyons, the Mobile brewery could not but be a credit to any city. As your labors are reaching their conclusion, Mr. President, I desire to say, not only in my own behalf, but also in behalf of our fellow-citizens, that your visit to this city has been one of infinite pleasure to the people of Mobile. I thank you.

Mr. Garrett, of Chicago, then proposed three cheers for the future senator of Alabama, Mr. Robinson, and they were given in good Chicago style.

Mr. ROBINSON (speaking for himself): I accept the nomination.

THE BANQUET.

The annual banquet was given at the Battle house on the evening of the 23rd, as announced. The banquet was attended by the delegates and their friends, together with some invited guests. The following invitation had previously been sent to the officers of the U. S. S. *Detroit*, which had just arrived in port, and in response to this invitation, Lieut. Commander James C. Cresap was present.

HEADQUARTERS OF THE SOUTHERN ICE EXCHANGE,
BATTLE HOUSE, MOBILE, ALA., February 22, 1900.

CAPTAIN DUNCAN KENNEDY UNITED STATES, NAVY, COMMANDING U. S. S. DETROIT, MOBILE, ALA.:

Sir.—The Southern Ice Exchange, now holding its annual convention in this city, cordially extends to yourself, and your co-officials of the *Detroit*, viz.: Messrs. Cresap, Clark, Leonard, Chase, Jewell, Crank, Hasbrouck, Woods, Braisted and Brown, an invitation to attend our annual banquet that will be given at the Battle house, on the evening of Friday, 23rd inst., at 9 P. M., and will thank you to indicate, at your early convenience, whom of the above we may expect the pleasure of entertaining.

Respectfully yours,
LOUIS P. HART, *President.*
WILLIAM E. WORTH, *Secretary.*

The issuance of this invitation was quite appropriate to the occasion, especially so as the membership of the Exchange includes a former graduate of the Annapolis Naval academy, Mr. J. C. Atwood, of St. Louis, Mo.

The dining room was decorated with palms and evergreens. One of the most noticeable decorations of the banquet hall was a block of clear crystal ice in which fish were frozen, looking very life-like. This piece was located in the center of the room between the tables. These were arranged in a parallelogram, the orchestra being stationed at one end, furnishing music throughout the evening. Covers were laid for 125 guests.

The tables were decorated with bowls of cut flowers, and pyramids of macaroons, surmounted with a platform of sugar which held a block of gelatine, in imitation of ice. These were surmounted with crossed ice tongs of sugar, and surmounted with tiny United States flags.

At the center of the speakers' table were seated President Louis P. Hart, who acted as toast master. At his right and left were respectively the Hon. E. B. Kirkbride, representing the city of Mobile, and Lieutenant Commander James C. Cresap, the executive officer of the U. S. S. *Detroit.* There were also

A Dinner Lubricates Business.—*Lord Stowell.*

MENU.

OYSTER COCKTAIL.
For this relief much thanks.—*Hamlet.*

SALTED ALMONDS.
We have some salt of our youth in us.—*Merry Wives of Windsor.*

SOUP.

GREEN SEA TURTLE, AUX QUENELLES.
Slow, but sure, like summer's advent.—*Jenkins.*

QUEEN OLIVES. CELERY.
"Cum grano salis."

SHERRY.
Whose liquid murmur heard, new thirst excites.—*Milton.*

BROILED POMPANO. CORKSCREW POTATOES.
From the rude sea's enraged and foamy mouth.—*Twelfth Night.*

HAUT SAUTERNE.
Then methought I heard a mellow sound.—*Tennyson.*

CRAB OMELETTE, MOBILE STYLE.
Unlike a crab, Mobile cannot go backward.—*Lyons.*

ASPARAGUS ON TOAST.
Fingers were made before forks.—*Swift.*

VEAL SWEETBREADS, A LA COLUMBUS.
The best thing Christopher ever discovered.—*Jenkins.*

FRENCH PEAS IN CREAM.
Unlike the ice man, green and fresh.—*Anon.*

ST. JULIENNE.
Good wine needs no bush.—*As You Like It.*

ROMAN PUNCH.
This was the noblest Roman of them all.—*Julius Cæsar.*

STUFFED QUAIL, DEMI GLACE.
At this juncture, do not quail.—*Anon.*

FRESH TOMATO SALAD.
Few things are impossible to diligence and skill.—*Johnson.*

CHAMPAGNE.
Kings it makes gods, and meaner creatures kings.—*Richard III.*

BISCUIT.
Our mouths be cold.—*Tempest.*

ASSORTED CAKES.
The last taste of sweets is sweetest last.—*Richard II.*

FRUIT.
May a hot summer in 1900 bear fruit.—*Anon.*

WATER CRACKERS. CHEESE.
"Not a mouse shall disturb this midsummer night's dream."

COFFEE.
A strong distillation.—*Merry Wives of Windsor.*

COGNAC.
Sparkling bubbles of pure delight.—*Jenkins.*

CIGARS.
Thou silent power whose welcome sway, charms every anxious thought away.—*Akenside.*

ALABAMA.
"Here we rest."

at the speakers' table the Hon. C. L. Lavretta, the Hon. E. M. Robinson, the Rev. Gardner C. Tucker, D.D., and Hon. Gregory L. Smith, all of Mobile, Mr. W. J. Rushton, Mr. W. S. Ware and Mr. J. H. Howe.

At each plate there was a lovely boutonniere, and a beautiful, dainty and artistic menu card.

The menu card was made of crepe linen paper, with an ornamental front of parchment paper, at the four corners worked into four crowns, and tied with knots of ribbon of various hues. In the center of this parchment front there was a cut-out in the shape of a shield, underneath which was a puff of blue silk, or other colored silk, across which was a band of parchment which supported a gilt bar, with the inscription, "How would you like to be the Ice Man?" Across the face, in center of same, was held a pair of gilt ice picks, holding a block of crystal. On the parchment front, above the shield, was a bough of pine, covered with icicles, and below an "ice pick," printed in gold. Within the inside covers of the menu were two blank pages for the autographs of those each guest might desire to have inscribed thereon. The menu was printed in red and blue. This card was gotten up especially under the directions of Mr. Louis P. Hart, and made an unusually handsome souvenir of the occasion. A copy of the menu is published herewith.

President Hart called the assembled guests to order, and called upon the Rev. Gardner C. Tucker, D.D., to invoke the divine blessing.

On coffee and cigars being served, Mr. W. J. Rushton arose and called the assemblage to order, and, in the name of the delegates, presented President Louis P. Hart with a fine sterling silver shaving set, in a handsome case, and also a fine silk umbrella, as a token of their appreciation of his efforts on behalf of the Exchange.

Mr. Rushton spoke as follows:

Gentlemen of the Ice Exchange: Mr. President, I have the honor to be deputized to present you with a token of the estimation in which you are held by the Ice Exchange and your "fellow-members in the business." We have to present you with this loving token—two of them—one for comfort, and the other for protection. The "soap" you know how to use. The cup you see there is a loving cup, and will be so, particularly after you have washed it. I have also to say to you that we appreciate the kindness you have always given us in the past, in the places where we have met. I propose also to present to you, sir, as a testimony of our esteem, something that will protect you from the wet, a silk umbrella, to cover you, as we trust the Divine Providence will cover you in all your ways. Sir, I present you with our testimonials.

President L. P. Hart responded as follows:

Gentlemen of the Southern Ice Exchange: I must confess that this present surprises me; in fact, I don't think that I deserve it. All I have done is to try and bring good fellowship among its members. I had half made up my mind to make a little speech to you to-night, but I rather think that the "close shave" you have given me, and my being "covered up" with friendship rather cuts me off. Mr. Rushton and gentlemen of the Southern Ice Exchange, again I thank you for the kind appreciation you have showered upon me.

President Hart then took charge of the post-prandial speaking, and said:

Members of the Southern Ice Exchange and Friends: It becomes my duty as president here to-night to introduce to you several gentlemen who have gathered to address you. There are also some members of the Ice Exchange who are anxious to address us, so I don't intend to take up your time. In answer to the query as to "How I would like to be the ice man," I would say that were I an outsider, and not in the business, I would not like to be the ice man. When you consider that our business is in the summer time, when every other branch of business is out

taking its vacation, and you are working like hogs on hominy, I think that we are entitled to a feast one day in 365, for what we have to undergo the other 364.

I was thinking a few moments ago of the tremendous progress that has been made in the ice business, even during my time. Only a few years ago ice was selling at five cents a pound, and gradually dropped to one cent a pound. The first machine erected in New Orleans was in 1868, and they got $20 for their ice, and didn't make a profit at that. Consider the price of ice to-day, together with the fact that we have to deliver it, whereas in the early days people came after it. When you consider these things you can realize the progress that has been made in the manufacture of ice. I think, gentlemen, considering the business we are in, we are public benefactors. Ice is no longer a luxury, it is a necessity; one of the greatest necessities of the times. What would the people in these southern climes, during the summer, do without ice? I say, gentlemen, that the progress of the ice machine in the last twenty years is phenomenal. I do not want to take up your time.

President Hart then read the following letter from his honor, the mayor of Mobile, J. C. Bush, Esq., expressing regret at his inability to be present.

MOBILE, ALA., February 23, 1900.

A. S. LYONS, ESQ., CHAIRMAN COMMITTEE ON ARRANGEMENTS:

My Dear Sir.—I regret exceedingly that I cannot be with you on the occasion of your banquet this evening, as I am quite unwell. Best wishes for a pleasant gathering to all.

Sincerely yours, J. C. BUSH.

President HART: We have with us the acting mayor, but he has earnestly requested me not to call upon him. In his place I call upon the Rev. Gardner C. Tucker, D.D., to represent the mayor, kind of second-handed.

The Rev. Mr. Tucker then spoke as follows:

Dan Tucker come to life again. Some men achieve greatness, some are born great and some have greatness thrust upon them. When Mr. Lyons asked me to come to his assistance, I gladly consented, never for one moment dreaming that I would have honors right from the mayor himself thrust upon my shoulders.

But, gentlemen, I did not dream that anything could have induced me to speak to-night under any circumstances; but being called upon to say something in behalf of Mobile, of the place where I live, the place that holds all that is dear and sweet and holy unto me, I would be but a dog were I not to say something to express the feeling of my heart.

"Be there a man with heart so dead,
Who never to himself has said:
'This is my own, my native land'?"

So I, in speaking of the city of Mobile, speak for my heart and home. I speak for her of the Queen City as one who merits the tongue of the highest orator, the brain of the greatest genius, to fitly set before the world her beauty and her worth; and when falls to me a task so great, what can I do to set before the world the beauty of Mobile? The Queen City is she, for every noble thing, for charity, for purity, for integrity and uprightness, for beauty of women, and noble character of men, but most of all is she noble for her prosperity.

In behalf of this city of the gulf, I extend to you, gentlemen, a hearty, solid welcome, a welcome of Mobile.

President Hart in introducing the speaker who was to respond to the toast, "The Navy," said: "In this great country of ours, whose flag now flies in all parts of the world, we sometimes think of the great things that led up to it; of the great men that helped bring it about, and in these latter days we have our Sampson, and that son of Alabama, Hobson; and when we think of these men, we think of that great branch of our public service, the navy. We have with us to-night a representative in that service; I therefore take pleasure in introducing to you Lieutenant-Commander James C. Cresap, of the U. S. S. *Detroit*."

Commander Cresap then spoke as follows:

I was thinking, as I came into Mobile this time, that it was a great deal easier to get into Mobile in the year 1900 than it was in the year 1864. We are going to have a parade here on Monday, and I hope to buckle on my sword, decorate the boat, have a good time generally, and I hope you will all be with us.

I wanted a little practice in this connection, and so I got my men out on the dock this morning, when it suddenly struck me that I hadn't obtained permission from the proper authorities. I went up to one gentleman for it, and he says: "That's all right, Captain, we aren't so particular now as we used to be."

I very much appreciate the honor you gentlemen have seen fit, Mr. President and gentlemen, to confer upon the navy, and I presume that takes in the army also—the "arms" of the government. I can understand it. I have seen the time the people in general hardly knew the names of our men of war; but to-day there is not a child but knows of every vessel in the navy. They know the names of Sampson, Schley, Dewey (prolonged cheers) and Hobson, as they used to know the names of Porter and Farragut; and they knew the name of Porter, the Father Porter, before him. But the fact is, I think there were and have been heroes in the American navy at every stage of the game, but it lacked the opportunity to demonstrate where they were. It is not given to us all to be the fortunate one.

I am very much gratified at your reception. I had supposed that I would have to run the gauntlet that I dreaded worse than the fire of the Elks.

I do not know exactly why the officers of the *Detroit* were invited to this banquet this evening. I had heard of the "ice man," and I pictured a man with a pair of tongs and a chunk of ice, but I was not expecting to meet the countenances which I see before me. I do not know why the compliment should be extended to outsiders; the only thing that I can account for is that the ordinary naval commanders do have a strange and familiar partiality to a chunk of ice and a lemon.

I am from the south, and when there is anything of this kind going on, I want to be there, and I desire to say to you that I very much appreciate the invitation that brought me here. I will say this, I rather suspected something of the kind (referring to the matter of his having to speak), and although I didn't come prepared, still I thought that something on "cold storage" would be appreciated.

I believe that it is pure and simple southern hospitality that prompted your courtesy in inviting me; as I said, I am from the South, and I can appreciate it. I arrived but a couple of days ago, and usually I do my talking through a brass horn on a ship deck, and I must confess that I was not prepared for this occasion. On our arrival here with the *Detroit* there was so much tooting of horns and blowing of whistles that I was not able to give the men on board directions for steering the ship. I had to give the signals by motions as the vessel came up the harbor, we got so many salutes. It took me a quarter of an hour to pack up and turn out, and, as some of you know, a good sailor always takes a wheel along. I got on to it and went up Government street. Very appropriate, and I asked a gentleman on horseback where the best roads were; the road I was on was "pretty rough"; I thought I was out on the shell road. He recognized me as a stranger and put his horse at my disposal, and in five minutes I not only had a horse but free entrance to all the clubs in the city. Gentlemen, I believe if he is not U. S. Senator Clark (referring to the gentleman who had loaned him the horse) I hope he will be very soon.

I say again, I very much appreciate the honor that you have done me, Mr. President. I think, for a sailor, I have spoken a long time, but I do assure you that I really do appreciate the hospitality which has so generously been shown to me, not only by the people of Mobile, but by you, their guests. I thank you, gentlemen, for your courtesy, and I am jolly well glad to be with you.

President HART: I will ask Mr. Cary W. Butt to favor us with a song.

Mr. Butt then sang "The Warrior Bold," which was much enjoyed.

President HART: I agree with the commander on the hospitality of the city of Mobile; I also go as far as the state of Alabama. It is quite right, and we really ought to have a toast to the city of Mobile in her relations to Alabama. In response to that toast, I call upon the Hon. C. L. Lavretta, ex-mayor of Mobile.

Mr. Lavretta then spoke as follows:

Mr. President, Gentlemen of the Southern Ice Exchange and Invited Guests: I desire first of all to thank you exceedingly for the consideration which has dictated to you to allow me to be present on this occasion with the distinguished guests that Mobile did well to honor, and who would be honored in the best city. Intelligent merit and good work should be recog-

nized and commented upon. But in speaking of the city of Mobile, and her relation to the state of Alabama, I realize that I need the flowery language of a Webster and the didactic incisiveness of a Gladstone, in order properly to discuss the subject; for it is a theme so replete, so redundant with interest, information, grandeur and sublimity that I scarcely can do more than make brief mention, and that in a cursory manner.

When you speak of the state of Alabama it means Mobile, for to you Mobile, the only port in the state of Alabama, is Alabama; for through her is she known, through her marine interests, agricultural, mineral and manufacturing wealth, to the world, more so than any other city south of Mason and Dixon's line. Mobile, from the time that De Soto landed on the everglades of Florida, and traversed the interminable forests, over hill and dale, never rested until he came within these broad domains—Alabama! "Here we rest." From that time up to the time that men located in the city of Mobile, Mobile has always been the capital city of the state of Alabama, Wealth, intelligence, education, and all those things which contribute toward making mankind more kind to man are here. Mobile is situated in her relation to Alabama as the locket of gold on the bosom of a fair woman. With the opening of the Nicaragua canal, I make you the prediction that Mobile will be the metropolis of the south, and it will be in reality what it has always been called, the "Queen City" of the south.

We have in our people, gentlemen, the stateliness of the Spaniard, the gentlemanliness of the French, the indomitable will of the German, the stubbornness of the English and the business acumen of the American, and all these stirring qualities go to make up a Mobilian. I am proud that I am one of them. I thank you.

President Hart then introduced the next speaker, Hon. Gregory L. Smith, who responded to the toast, "The Law":

Mr. President and My Friends: I am almost "too full" for utterance. I came here to-night empty in stomach and empty in pride, but after I have heard the eulogies of the Rev. Mr. Tucker upon the place where I reside, and the laurels thrown upon the whole state of Alabama by my friend Lavretta, I have swelled up like a toad until there is hardly any room for speech or anything else but pride of birth and pride of locality. You have provided for your president something to take him out of the wet, and when I saw that presentation, I foresaw that somebody might call on me to say something that I didn't know anything about. I have been considering of what the life of the ice man consists, and from what I have observed during their stay with us, I think it is constituted out of love of liberty, independence of home and marital relations, and permission to travel until 3 o'clock at "night." And when I heard my friend Lavretta speak of the standard of excellence to which he, as a Mobilian, had reached, I honestly wondered what the destination of the ice men would ultimately be, particularly at such an early hour in the morning.

Like a Roman senator, I feel proud, I feel lifted up above my fellows. I am a Mobilian! and I want this vast assemblage to understand that we are the best people the sun ever shone upon. Admire our hospitality; look at, and be proud of our city. Admire, together with our lieutenant commander, the grandeur of our roads, which he, with his bicycle, has described from the standpoint of a wheelman, and then, gentlemen, excuse your humble servant from being able to attend to anything more than your hospitality has provided for him.

President Hart then called upon Mr. Sarjeant to favor the company with a song. Mr. Sarjeant sang the song entitled, "The Germans Are a Noble Race," which was well received.

President HART: While on the boat on the excursion, I heard numerous remarks about the ladies of Mobile, to the effect that the ladies of Mobile excelled in beauty those of any other city. We should drink to the "Ladies of Mobile," and I ask you to rise and drink to the ladies of Mobile.

The Hon. E. M. Robinson will respond to the toast, "The Ladies."

Mr. Robinson then responded as follows:

Mr. Toastmaster and Gentlemen of the Southern Ice Exchange: It is honor enough to be permitted to participate with you in this delightful celebration, but when to the charming incidents of this occasion is appended the high privilege of responding to the sublimest toast that ever touched the hearts of men, or appealed to the tender sensibilities of humankind, I am convinced, sir, that for to-night, "the lines have fallen unto me in pleasant places."

Especially, gentlemen, am I favored of the gods, that I am called upon to answer for the fairer sex in a metropolis of beautiful women, a star center, as it were, of feminine loveliness, and I trust that the members of this Exchange will believe me, when I say that it is neither patriotism nor local pride, but simply the fidelity which I owe to history, fortified by the expressions from the pulpit, confirmed by the eloquent testimony of eloquent men, and backed up by the intrenchments of the brilliant and able lawyer. I say, I trust you will believe me, when I state that Mobile has within her borders the loveliest women that ever beautified and adorned the face of God's green earth.

Indeed, my friends—and I believe some of you have already discovered it—they are as frequent here as the proverbial autumnal leaves that are wont to strew our tracks; as radiantly fair as the dew kissed fruit and flowers that shed their rich perfume in the garden of the Hesperides, and their loyalty and devotion are as constant as eternal fire. The melting music of their voice is sweeter far than Menolian melodies, and the gladness that glints and glows beneath their eyes more formidable, on the whole, than those concentrated batteries which scattered death and destruction among the British at Spion Kop.

Now, gentlemen, you might take me for an enthusiast. [Laughter.] To those of you gentlemen who are incredulous, I have this to say, When your business sessions are concluded, and you fix the "price of ice" to suit yourselves; or when you have finished your humanitarian efforts with us, and see to it that your fellow-citizens are furnished with an abundance of that congealed luxury that drives fevers from the brain of man; and when all your deliberations are completed, I ask you to linger among us yet awhile; to meet the fair daughters of Mobile, as I and many of us have done, and rest at their feet, then go forth to your fellow-men and proclaim the gospel—the ladies of Mobile.

I have to make a reservation to that; prudence demands it. I am compelled to limit that last suggestion to the "single" men in the aggregation, for the reason that to those of you who are married, I bring a word of advice: escape as soon as possible, "Lest you forget, lest you forget."

But, gentlemen, it would not be courteous on this occasion for me to confine myself to the discussion of the charms of Mobile women. The women of Mobile are simply a type of all women everywhere. I speak of women in general. Were every word of mine a shining star and every sentence a gleaming constellation, and every paragraph a Milky Way, I still could not adequately portray the transcendent character of that theme; for though my heart were strung with Apollo's golden hair, and though the same divine power who touched Isaiah's unhallowed lips with fire, see fit to enhance my language with the potent power of divinest eloquence, I still must be beggared of expression, and language must still linger and loiter, crippled on my tongue, when I come to answer to the toast of woman; believing as I do that she is the grandest of all God's grand creations; convinced as I am—and it is an orthodox conviction—that the great Jehovah invoked all the hidden powers of His divine ingenuity, and well nigh exhausted the fountain of His creative genius when He took forth from the rib of man that divine conception of His will. I for one am always ready to bow the knee of silent veneration when I am in her holy presence.

Gentlemen, John Ruskin once said—and he was, perhaps, one of the greatest masters of the human heart that ever lived—"That no man had ever lived a right life who had not been chastened by a woman's love, strengthened by her courage, and guided by her discretion." And the great philosopher spoke truly and well, because surely there is no power this side the breathing gardens of God, so far-reaching in its scope, or resistless in its march, as the influence of woman. Her sphere co-extensive with the universe; her empire is the wide, wide world.

It is fitting in a gathering of ice men, or any other men, that genuine tribute should be paid to that exalted sex; and permit me to say that I would not for all the fabled wealth of Crœsus blot the flashing bloom of beauty from maiden's cheek, nor quench the lingering light of love that flashes from her eye. I believe that when the Queen of Sheba came with her glittering presents to King Solomon, old Solomon saw more loveliness in her queenly face than all the bejeweled trinkets. And history says that Solomon was passing wise.

Her charms, gentlemen, are as numerous and as multitudinous as the limitless sands upon our shores; and yet she has a grander destiny than to wield the scepter of empire in the heart of man; her mission is to love and be loved of all races and nations on the face of the earth, and her grand destiny will not reach its final climax until this old revolving world shall cease to roll; then love and light will lift her to the infinite.

Permit me to say in this last tribute to woman, that she by her very presence makes the world around her nobler, purer, better. She touches with soft magic hand her father's brow, and removes the wrinkles of care that nestle there. She brings back to her mother's fading cheek the glow of health and happiness. She raises again her husband's drooping spirits when the clouds of gloom brood and when despair sets heavy on his heart. In the pandemonium of war she stands as a sweet angel of peace; she enters the cottage of the humble widow and floods it with the joyous light of courage and contentment, and makes the lonely widow's heart go out in abundant gratitude. She drags from the gutter debased and fallen man by that magic power she alone can wield, she stands him on his faltering feet, and bids him hope once more. She drives away the tears of sorrow, alleviates the pangs of pain; floods the air around her with the sweet incense of joy, and introduces all about her to

the region of harmony, peace and love; and permit me, in the eloquent language of a son of Georgia, in conclusion to say: "The work which falls best to the hand of woman is such work as is done by the dews of night, that come not on the boasting winds that ride at noon, or garish sun, but that come when the wind is still and the sun is gone and the night has wrapt the earth in its safe keeping, with the very stars themselves upon the porch, and waiting winged creation crying a benediction from God." I thank you. [Hearty applause.]

President HART: I believe in honor where honor is due. We have with us the chairman of the committee on arrangements. I now introduce him to you, Mr. A. S. Lyons.

Mr. Lyons then spoke as follows:

Mr. Chairman, Brother Members of the Southern Ice Exchange and Gentlemen: I do not know that I have any words that I can express any feeling that I may have. To listen to the speaker who has preceded me, I am satisfied, has been a treat. He has been endowed by God with an eloquent tongue. He can speak with more enthusiasm and more grace and with better ease than possibly any other man here to-night. He had a great theme, and he did great justice to it; I can tell that from the way you approved of it.

Then again, we had our leading attorney, Mr. Smith, who spoke to you, but he always speaks "wisely" and well. We had our excellent ex-mayor with the silver tongue, whose words are golden, a man of the greatest versatility on "two" different occasions now, one in a comic phase and the other serious; he made a great deal of himself on both occasions. You have also here the talented minister of the Gospel, a man whom we love, whom we honor and whose practice it is to give us good advice, which we always like to receive, but sometimes don't follow. However, I hope that in asking these gentlemen to do us the honor of addressing us that they have pleased you. I believe they have. I feel satisfied that I have accomplished that much. As to anything else we have at Mobile, that has already been touched upon. I cannot say anything about Alabama because we have so many of its representatives here, they can take care of that. Then we have our friend the lieutenant-commander, who touched upon the whole United States. I don't believe he went to the Philippines, though—I first want to know if they are a part of the United States—there is one fellow there we ought to have in our legislature.

I am glad, gentlemen of the Southern Ice Exchange, that the people here are glad to have you, and they will be delighted to have you some other time. We have endeavored to put our best foot foremost, and we have endeavored to make it pleasant for you. While our means were somewhat limited, I can only say that the "will" was there, if not the "way." We hope you will go away from here with pleasant memories, and that some time when you hear them speak of the great city of Mobile, you will be able, of your own volition, to give the city a testimonial, if not for the entertainment, at least for the speeches that have been made.

We have enjoyed some reputation in the past on the score of our hospitality, and we trust to be able to strengthen that reputation, and we hope to maintain it upon every and all occasions. I hope that this meeting has not only been one of pleasure, but one of profit to us all. I hope my friend, Bonnell, will sell some paint, and I trust that his competitor, P. & B., has got some pocketbooks. I hope' 'The Boy" has got to be a man; that the talented editor of ICE AND REFRIGERATION will have enough to fill a book; that the honorable gentleman from Wilmington has got his money's worth, and the other man, who told him how to do it; and now, I know that I am probably taking up your time, so I will "Rush-ton" it.

Well, now, I want to state in conclusion, that we have been delighted to have you; hope you intend, and trust you will, come again. Anything I can do to help things along I will be only too happy and willing to do. The pleasure has been mine in seeing you pleased. Gentlemen, I thank you.

President HART: We have with us one of the members of the Southern Ice Exchange, from another part of Alabama, who knows about the ladies of Mobile, Ala., and any other state; it is no more than right that we should hear from him. I now have the honor to introduce Mr. Rushton, of Birmingham, Ala.:

Mr. President and Gentlemen: It is customary, gentlemen, to apologize for not being prepared; I shall not do it. I have listened to the eloquent gentleman, and I believe all about the reservations, but when he says that Mobile has the only pretty ladies, he is mistaken. He is all right, but he don't travel. If he only traveled, and would come to Birmingham, he would never stop until he got to Utah.

Now, I appreciate all this talk of hospitality. The mayor of the city did n't do anything for us; he might have intrusted to us the keys of the city, but he did n't do it. He was afraid of us taking them away. To the credit of Mobile be it said, that they could not give us the keys.

There is a story told of them, and I believe it, that many years ago they had gates to the city. It was one of the old towns, and one day there was a delegation, or a lot of foreigners from a neighboring state wanted to get in. They had a great deal of trouble in getting the keys, and so the mayor of the city concluded that he would n't be bothered with keys any more, and threw them in the river, and this city has been "wide open" ever since. Wide open with her hospitality; they "take you in"—how, you will find out before you go away.

You have heard a great deal of law and order and everything of the kind; I want to tell you what I had to do the day before yesterday, in order to keep everything right; I had to invest one of the ladies with a police star as a Sergeant No. 106. Some of you did n't see it, because you were out late last night with the Elks.

There are eloquent gentlemen here, and you have heard them. It has been said that a gentleman from this town (and I have a Chicago man's word for it) once went to Chicago. The gentleman last night was the chairman of the Elks' committee; now, if you had seen him in that position, you would appreciate more fully the Chicago joke that is told on him. It is said that while in Chicago he attended a meeting of the Epworth League, and while addressing the little tots, and expressing to them his opinion on the Divine handiwork, he said: "The great Master who made the mountains made the little grains of sand that you see on the sea shore; the great Master who formed the universe made man in his own image; he made me—and he made a 'daisy.'"

I can only say, after thanking the Mobilians for their hospitality, that I have been imposed upon by the president of the Association, after furnishing him with "protection," when I need some myself. I thank you, gentlemen.

President HART: We have here with us the Hon. J. J. Delchamps, member of the Alabama legislature.

The gentleman spoke as follows: "I am no orator. I will not attempt to make a speech, because I have not the eloquence to cope with the speakers that you have listened to to-night. I can tell you, however, something about Mobile, having lived here since 1827."

(The gentleman then went into some of the earlier reminiscences, both of his own life and the city of Mobile.)

Speaking of the earlier days in Mobile, he said he well remembered the time when you couldn't get a pound of ice, except on a prescription from a doctor; simply could not get it. The time referred to was the period, 1839 to 1843. For six weeks at a time he had grappled with yellow fever patients, and never took off his clothes for weeks together, except to go home and change them. He expressed pleasure that science had come to the aid of man in the manufacture of ice; he rejoiced that ice was used for nearly all ordinary purposes, although to quote his own words: "I do not care for very much in mine."

He then went on to say:

Whatever is good in me is due to my mother and my wife. Don't talk to me about woman; no man living in this world honors woman more than I do; her worth is priceless. One word more: I am always glad to see gentlemen come here from the north and west to visit Mobile. I am glad to see intelligent men coming here to spend several days, and to get slightly acquainted with the city of Mobile; and let me tell you, many of you have never visited Mobile, some of you have never visited Mobile before, and I hope that from the little you have seen of it while here that you will go back with a favorable impression; and if any of you have had any bias against Mobile go back and revise it. Mobile is not such a bad place as you have been told.

President HART: Gentlemen, we have heard a great deal of the south, and it is well; for whereas Horace Greeley said to young men, "Go west, go west," we will be able to say, "Go south." We have a man here from the northwest who has come south, and we will call upon him to defend himself: Mr. E. T. Skinkle, of Chicago, Ill.

Mr. Skinkle spoke as follows:

Mr. President and Gentlemen of the Southern Ice Exchange, and Our Kind Friends Who have so Generously Entertained Us Here: All I have to say is "Tempus Fugit," in consequence of which I shall take as little of your time as possible.

I have listened with a great deal of interest to all the speeches that have been made this evening by eloquent orators; the first by the Rev. G. C. Tucker, who, in the name of God, buckled us to the city of Mobile. I want to say that this is not the first time I have been welcomed to your city. I have heard a great deal about the various flags, but I remember in my welcome heretofore that the flag of the city of Mobile was of another color. It was a yellow flag, and so tremendous a welcome as I shall never forget. It nearly kept me here. I did not hear the gentleman refer to that flag, one of the strongest and most stringent welcomes, so tremendously welcome that I had the dickens' own time getting out.

The next speaker was the commander of the navy. He said he had a horn. I wish he had brought his horn. It would have helped me out.

The next thing I want to refer to is the south. I am from Chicago, and although I would feel proud to be a southerner, I cannot back out of my nationality or the place of my birth.

Chicago is known as the Windy City in the state of Illinois, where we are called "suckers," but I want to say, gentlemen, that last night at the stag party, given in our honor by the Elks, we came across the windiest sucker I ever struck in my life. Mr. Smith spoke on law and order. I never saw any law since I came here.

The next speaker (Mr. Robinson) was some representative member of the legislature who paid one of the most fitting and beautiful tributes to women, that it has ever been my pleasure to listen to. I want to say that I am a married man for twenty years; have grown-up children, and I will take his advice and follow the old law. The next speaker was Mr. Rushton, and the least said about the gentleman the better I am off, as I meet him quite a great deal in the north. The next on the roll was the interesting gentleman who immediately preceded me. I would like very much to have the history of the city of Mobile as he has seen it; it would be a matter of considerable interest to most of us present.

To Mr. Lyons, who so ably has entertained us since we have been in the city, I want to express my personal thanks. We carry with us, *i. e.*, all the guests of the Exchange, we, who are not active members here, but who come to your meetings at various times and places, we feel that we are under obligations not only to the Southern Ice Exchange, but to the gentlemen who have so generously and so loyally entertained us. I have had as fine a time in the city of Mobile as I ever had in my life. Personally I desire to express my thanks to Mr. Lyons.

In conclusion I want to say that I expect "the lady" is waiting for me at the door, and the sooner I get out, the better it will be for me. I thank you.

President HART: In closing these festivities I will ask Mr. Sarjeant to start "Auld Lang Syne," and the members will join in.

This was done, and the meeting came to a close at 2 A. M.

LIST OF DELEGATES.

Among those in attendance at the convention were the following:

ALABAMA.

Birmingham:
James A. Going, Birmingham Ice Factory Co.
James Arnold Pilcher, Bessemer Ice Delivery Co.
W. J. Rushton, Birmingham Ice Factory Co.

Decatur:
J. E. McBride, Decatur Ice and Coal Co.

Gadsden:
C. S. Ward, Gadsden Light, Ice and Coal Co.

Huntsville:
C. F. Sugg, Huntsville Electric Light, Ice and Power Co.

Mobile:
John Barbich, Consumers' Ice Co.
H. W. French, Stonewall Ice Co.
A. Kling, Consumers Ice Co.
A. G. Levy, Stonewall Ice Co.
A. S. Lyons, Mobile Ice Co.
P. J. Lyons, Consumers Ice Co.
R. Mellete, Stonewall Ice Co.

Montgomery:
E. J. McAdams, Alabama Brewing Co.

ARKANSAS.

Helena:
Leon Berton, Helena Ice Co.

FLORIDA.

Apalachicola:
Geo. H. Whiteside, Apalachicola Ice Co.

Jacksonville:
W. S. Ware, Jacksonville Refrigerator Ice Works.

Palatka:
H. A. Davis, G. M. Davis & Son.

Pensacola:
J. R. Keller, Stratton Ice Works.

GEORGIA.

Atlanta:
Charles H. Behre, York Manufacturing Co., York, Pa.
Sol Benjamin, Standard Ice Co.
J. C. Bertsch, Frick Co., Waynesboro, Pa.
E. E. Eagan, Fred W. Wolf Co., Chicago.

Rome:
J. W. Hancock, Rome Ice Manufacturing Co.

ILLINOIS.

Chicago:
A. H. Barber, A. H. Barber Manufacturing Co.
Charles E. Bonnell, Nubian Paint and Varnish Co.
E. W. Buss, Chapman Valve Co., Boston, Mass.
M. A. Garrett, F. W. Bird & Son, E. Walpole, Mass.
George S. Haskell.
Thomas W. Lamble, Official Stenographer, ICE AND REFRIGERATION.
J. F. Nickerson, ICE AND REFRIGERATION.
Charles E. Piper.
George H. Rempe, Farrell & Rempe Co.
Eugene T. Skinkle.
J. M. Westerlin, Westerlin & Campbell.

INDIANA.

Seymour:
L. A. Ebner, John Ebner Ice Co.
Louis Vogel.

Vincennes:
Joe J. Soete, John Ebner Ice Co.

KENTUCKY.

Fulton:
R. H. Wade, Jr., R. H. Wade Bros.

Lexington:
R. E. Hunt, Lexington Railway Co., Louisville.

Louisville:
Chas. A. Cox, City Delivery Co.
Henry Vogt, Henry Vogt Machine Co.

Paducah:
Frank H. Rieke, Paducah Ice Co.

LOUISIANA.

New Orleans:
Louis P. Hart, Crescent Ice Co.
J. G. Jenkins, City Delivery Co.
F. W. Matthews, Gulf Bag Co.
Paul Waddell, Barrett Manufacturing Co.
W. W. Sumner, Samuel Cabot, Boston.

MAINE.

Portland:
Dr. Wm. A. Wheeler, Mutual Ice Co., Charleston, S. C.

MISSISSIPPI.

Canton:
H. W. Campbell, Canton Ice Factory.
L. Foot, Canton Ice Factory.

Columbus:
Samuel Kaye.

Greenville:
C. E. Livingston, Greenville Ice and Coal Co.

Meridian:
C. D. Palmer, Palmer & Kaye.

Natchez:
R. F. Learned, Natchez Ice Co.

MISSOURI.

Kansas City:
Frank O. Rettig, Grand Avenue Ice Co.

Poplar Bluff:
W. B. Hays, Poplar Bluff Ice and Coal Co.

St. Louis:
J. C. Atwood, National Ammonia Co.
Alfred Siebert.
J. S. Wilkins, Herf & Frerichs Chemical Co.

NEW YORK.

New York City:
F. W. Flint, E. H. Kellogg & Co.
J. N. Richards, Standard Paint Co.

NORTH CAROLINA.

Wilmington:
Wm. E. Worth, W. E. Worth & Co.

OHIO.

Cincinnati:
C. P. Torvin.

Cleveland:
T. C. Bailey, Grasselli Chemical Co.

PENNSYLVANIA.

Chester:
S. P. Stevenson, Stevenson Co., Ltd.

SOUTH CAROLINA.

Anderson:
Geo. B. Townsend, Anderson Ice and Coal Co.

Charleston:
Samuel Lapham, Charleston Ice Manufacturing Co.

TENNESSEE.

Chattanooga:
L. C. Riggs, Chattanooga Cold Storage Co.
Clarksville:
Geo. S. Bowling, Clarksville Ice and Coal Co.
Nashville:
J. H. Howe, Howe Ice Co.
Pulaski:
Basil S. T. Dobree, Pulaski Ice and Refrigerating Works.
Union City:
Geo. Dahnke, Union City Ice Co.

EXHIBIT OF SUPPLIES.

Arrangements had been made for a display of supplies and materials on the main floor of the convention hall. A number of manufacturers and dealers took advantage of this to bring their goods to the notice of the delegates attending the convention. Among those making displays were the following:

Wm. T. Wood & Co., Arlington, Mass., exhibited a number of high grade summer ice tools, together with a very complete illustrated catalogue, descriptive of their various tools, with prices, etc.

The Standard Paint Co., of New York city, exhibited samples of insulating paper, and distributed a little pamphlet entitled "A Practical Guide to Insulation," as well as circular matter pertaining to their insulating papers and paints. They also presented to each delegate a souvenir pocket book, and to the ladies a very dainty memorandum book bound in white silk.

The Chapman Valve Manufacturing Co., Boston, Mass., exhibited samples of their ammonia valves, together with circular matter.

F. W. Bird & Son, East Walpole, Mass., distributed samples of their insulating papers, together with circular matter. They also distributed a handsome souvenir of the occasion in the shape of a very convenient calendar for use on the office desk.

Strauss & Co., New York city, distributed circular matter regarding their well known "Boilerine."

Barrett Manufacturing Co., New York city, exhibited samples of their insulating paper and circular matter.

Nubian Paint and Varnish Co., Chicago, Ill., distributed circular matter regarding their "Nubian Black" and paints and varnishes.

The International Filter Co., Chicago, Ill., distributed circulars relating to their distilled water filters. One of these filters was also exhibited at the factory of the Mobile Ice Co.

Samuel Cabot, Boston, Mass., exhibited sample of insulating "quilt," and circular matter descriptive of same.

The Star Brass Works, Chicago, Ill., distributed circular matter descriptive of their whitewashing machine.

G. M. Davis & Son, Palatka, Fla., distributed pamphlets on "Tank Talk," by the "men who make them right."

Elliott Varnish Co. of Chicago, distributed advertising matter descriptive of their ice machine black.

THE LIQUID AIR BUBBLE.

STRANGE how easily people are convinced by glittering generalities! By these the Keeley motor fraud captured hundreds and thousands of intelligent investors. The South Sea bubble ruined thousands. Will the liquid air bubble be the next?

INCREASING THE THERMAL EFFICIENCY OF THE STEAM ENGINE.

THE idea broached some time ago by Behrend and Zimmermann of utilizing the waste heat in steam for heating up some other fluid having a lower boiling point than water and employing the vapor thus generated as a source of motive power, has recently been practically developed by Professor Josse at the Royal Technical High School, Berlin. The fluid employed is sulphurous acid, a material already used in connection with refrigerating machinery. This is pumped into the condenser in place of water, and is heated by the steam to a temperature of about 60 C., thereby developing a pressure of ten to thirteen atmospheres; and this vapor on being delivered into a cylinder similar in construction to a sulphurous acid compressor, expands and exerts mechanical force just in the same manner as steam does in an ordinary engine. On issuing from this cylinder the sulphurous acid gas is cooled to its initial temperature by the water which would ordinarily be used in the steam condenser, and is then ready to act again as a condensing medium, thus performing a cycle. The increased power obtainable by this means from a given quantity of steam is about 56 per cent, and is greater in the case of steam engines of low efficiency.

The experiments of Josse show that for every thirty-three pounds of steam passed through the steam engine, one indicated horse power was developed in the sulphurous acid engine; hence, if these results be referred to a 3,000 horse-power engine, consuming fifteen pounds of steam per one horse power, the employment of the sulphurous acid supplementary engine would increase the efficiency of the plant by 50 per cent, or 1,500 horse power, without any greater outlay for fuel.

An additional sphere of usefulness for this system consists in the utilization of the waste heat from furnace gases, and waste water, a temperature of 60° C. being sufficient to develop high tension in sulphurous acid gas. Moreover, the cold vapor of this gas in a refrigerating machine could be employed to drive the machine itself and simplify the installation. Although, perhaps, sulphurous acid is open to certain objections, as, for instance, the inconveniences it causes when contaminated with water, there are other fluids, notably ammonia, suitable to replace it. Whichever be selected, there is apparently a great future for this system.—*Country Brewers' Gazette*, of *London, Eng.*

NEW BOOKS.

CONDENSERS. A series of lectures and articles reprinted from the columns of *Power*. New York: Power Publishing Co., 1900. Limp cloth pamphlet, pp. 80. Price, $0.50.

Lecture VIII, a monograph on condensers, by F. R. Low, forms a pamphlet of seventy-nine pages, including the tables and index, and gives, in popular scientific style, a comprehensive account of the various types of steam condensers. Fluid and absolute pressures, the nature and measurement of a vacuum, the gain by condensation, the amount of cooling water required under varying conditions, and other fundamental elements are treated at length. The subject of cylinder condensation is treated with the fullness that this important item warrants, while due attention is also paid to surface condensers, injectors, etc. The little work will prove interesting, as well as instructive, to engine users, or owners of steam plants.

[*Translated from the* ZEITSCHRIFT FUER DIE GESAMMTE KAELTE-INDUSTRIE.]

THE REFRIGERATION OF DWELLINGS.

RELATIVE COST AND VALUE CONSIDERED—SCIENTIFIC PRINCIPLES ON WHICH TO CALCULATE AMOUNT OF REFRIGERATION REQUIRED—DIRECT AND INDIRECT SYSTEMS.

BY PROFESSOR E. BRUECKNER, OF MUNICH.

ALL the different projects for the ventilation of dwellings and working rooms by means of refrigerating machinery, which have been planned and prepared up to the present day, are handicapped by the relatively high estimates of the cost of such plants, especially when compared with the cost of even the most improved central heating apparatus. There will be no permanent objections to the expenditure of an amount varying from 5,000 to 8,000 marks (about $1,200 to $1,900) for the heating plant of a fashionable residence, because people desire protection against the cold of winter; but the demand for an equal, or even higher amount, to be expended for cold air ventilation in summer, is resisted, as experience teaches, even by the millionaire, desirous of providing his country seat with all modern comforts. It may be reasonably assumed that time will demonstrate the great value of the highest possible improvement of the hygienic conditions of human habitations with relation to their effect upon the health and vigor of mankind, and that to provide relief from the enfeebling effect of a hot summer temperature in dwelling and sleeping rooms, the same amount of money would be invested to better advantage, than for the artistic decoration of a dining room ceiling with wood paneling. But the mechanical ventilation and refrigeration of dwelling rooms will always be looked upon as an expensive luxury, especially in our climate, and would never rise to the position of an independent branch of the refrigerating industry, were it not for the existence of other climatic conditions, and, above all, for other objects to be achieved. In our temperate zone, cold air ventilation is bound to be introduced into certain industrial establishments for the benefit of workingmen, and, particularly, into the hospitals of the future; while in the torrid zone a far more extensive application will take place, keeping pace with the growing demand for comfort. For these reasons it does not seem out of place to supplement our account of the present development of mechanical cold air ventilation, published in preceding numbers of this periodical, by a few statements concerning the scientific principles upon which to base the calculation of the amount of refrigeration required for different purposes.

We repeat the fundamental proposition, heretofore stated, that the object of cold air ventilation can only be accomplished, if the reduction of the air temperature is accompanied by a reduction of the absolute degree of moisture contained therein. Based upon this duplex requirement, the necessary capacity of the refrigerating machine must be calculated—

First.—According to the amount of heat entering the rooms. The same is made up of the heat penetrating through the walls exposed to the rays of the sun and in direct contact with the warm outside air, and the heat generated within the rooms proper through the inmates and from the illumination.

Second.—According to the volume of fresh air hourly to be inducted into the rooms, and the original and the contemplated final temperature of the same.

Third.—According to the degree of moisture in the fresh air, and the relative volume of moisture required for the rooms.

The multifarious factors, independent of each other, to be considered, do not permit of determining the volume of refrigeration required as one total—for instance, as a quantity proportional to the cubic contents of the room in question. It is necessary to calculate in each particular case the sum total of all the different items of heat originating from the different sources mentioned, and to be removed by the refrigerating apparatus. The following suggestions may be of service in this connection.

First.—The volume of heat to be permanently removed from the rooms is dependent—

(*a*) Upon the dimensions, construction and location of the walls inclosing room, or rooms, to be refrigerated.

(*b*) Upon the number and occupation of the inmates of the rooms.

(*c*) Upon the illuminating medium employed.

The heat to be calculated under *a* is proportional to the heat conducting surface (O); it decreases, therefore, together with the latter, in the proportion that the room, or the total of rooms, approaches the cubic form (not speaking of curved wall surface); the passage of heat may, furthermore, be considered directly proportional to the difference between the outside and the inside temperature (Δ_t); finally, the penetrability of the walls and certain parts (openings) of the same (windows and doors) by heat may be characterized by a co-efficient (x), dependent on the material, thickness and condition of surface. The formula for the volume of heat to be removed hourly in its relation to the unit of surface of the outer walls, is therefore $Q_a = O \Delta_t K$, or with respect to the varying character of certain parts of the wall,

$$Q_a = \Delta_t \Sigma (OK)$$

With Δ_t given and the total of surface $\Sigma(O)$ fixed, this expression can be reduced by a change of x only. In a temperate climate it is sufficient in this connection to provide for a smooth and dry surface of the walls, constructed of normal thickness, and of perfectly dried material, and, if necessary, protected by insulating layers against moisture rising from the soil. The effect of color on the walls upon their heat radiating capacity is generally overestimated. A wall surface painted black absorbs and issues more heat than one painted white, especially when lampblack is used as coloring substance, because the painted surface is rougher than when, for instance, white lead or other heavy body colors are used.

The nature of the wall openings is of more importance. Single windows and doors permit of air draft, causing in itself a considerable loss of cold through the influx of warm air; double windows, and, if possible, double doors are to be recommended, a body of air in rest being known to be the best insulating medium. Air tight anterooms with air gates, as used for the entrances of refrigerating chambers, are not

necessary; heavy and tight door curtains afford sufficient protection against radiation, induction and convection of heat. The last named must be particularly guarded against, being apt to nullify the whole refrigerating effect, as shown by the following observation communicated by Professor Recknagel to the "II. Meeting of Heating and Ventilating Experts":

"I desire to call attention to a singular experience which may have been observed by the gentlemen who attended the hygienic exposition at Berlin in the year 1883. For the purpose of cold air ventilation in a restaurant pavilion a motor was put in operation, forcing the air over ice tanks into the dining room at a height of two meters. The effect produced was a failure in two respects: the temperature in the dining room was not reduced sufficiently to make it pleasantly cool, while, at the same time, there was a steady draft of such force toward the doors, that it almost required an effort to enter the place. I make this statement in order that in future plants of this kind which must be hailed as a step forward in mechanical progress, the mistakes made here may not be repeated. What were those mistakes in the Berlin restaurant building in 1883? No attention had been paid to the roof being constructed as air tight as possible. When, for example, air is permitted to pass in through other channels than the pipes provided, the whole object may be frustrated. Air, drawing heat from the roof, enters the room in such volumes that the air entering through the pipes may possibly be regarded as insignificant, and the effect is offset."

Together with good construction of the doors and windows, weather strips and automatic door closers are to be recommended. Solid construction of the floors and ceilings is, as a matter of course, of no less importance, while inlaid floors, thick carpets and paneled ceilings, as frequently found in dwellings, are very valuable adjuncts. In tropical countries a distinct construction of the walls with regard to

TABLE 1.

Thickness of Wall.	0.25	0.38	0.51	0.64 M.
Full brick walls	$x = 1.9 - 2.8$	$1.4 - 1.7$	$1.2 - 1.3$	$1.0 - 1.1$
Full rubble stone walls	$2.6 - 3.6$	$2.3 - 3.1$	$2.1 - 2.6$	$2.0 - 2.4$

Thickness.	2	4	6 cm.
Single doors and wood partitions. Pine....	$x = 2.2 - 3.1$	$1.5 - 1.9$	$1.2 - 1.4$
Oak....	$2.9 - 4.6$	$2.3 - 3.2$	$1.9 - 2.4$

Double doors	x = about half as large as for single doors.
Single windows.....	$x = 4.5 - 7$
Double windows.....	$x = 2.3 - 3.2$
Wooden floors over cellar or natural soil......	$x = 0.7$
Ordinary room ceilings......	$x = 0.65$
Stuc'o'd ceilings with board lining and filling....	$x = 0.37$

house ventilation is advisable; a hollow wall (with bricked in dead air shafts) or a lining of cork plates or other insulating material will serve the purpose.

The calculation of the heat Q_a can only be approximately (owing to the opening of doors, etc.); a liberal allowance is therefore required. The following values of x may be used for the calculation:

x = passage of heat in calories per one hour, one qm. (square meter) surface, and 1° C. difference of temperature. (See Table 1.)

Among the above figures the smaller values always stand for calm air, the larger ones for air in motion.

To demonstrate by an arbitrary example how to make an approximate calculation, we select the following task, corresponding to a tropical climate: A private dwelling house, containing four rooms, of forty square meters average floor space, is to be kept at a temperature of 18° C. in midsummer. If the series of rooms is arranged as a square, the hourly passage of heat, for a room height of four meters, and with a liberal allowance for door and window openings, is calculated for $\Delta_t = 1°$ C.:

Through about	200 sq. mtrs.	(2-brick thick) wall sur...	240 cal.
" "	30 "	double windows..........	96 "
" "	12 "	single outer doors........	38 "
" "	160 "	stuccoed ceilings........	60 "
" "	160 "	floor space...............	110 "
Total		....	544 cal.

Assuming an outside temperature of 36° C., or $\Delta_t = 18°$ C., we find the refrigerating capacity $Q_a = 544 \times 18 = 9{,}800$ cal. required per hour to remove the heat penetrating through the walls.

(*b*) To determine the volumes of heat generated by the inmates, we may assume that a man in bodily exertion generates 130 cal. per hour; while resting about half that volume; children, about 40 cal. The heat generated by ten persons continually present in the house may be placed, for illustration, at $Q_b = 650$ calories per hour.

(*c*) To determine the volumes of heat generated in rooms through the illumination of the same, and also to be removed by cold air ventilation, in order to secure constant evenness of temperature, the following data may be used:

	Per 100 normal candle power generation of calories per hour.
Electric arc light........................	in center 110
" incandescent light	" 410
Illuminating gas, regenerative lamp	" 1,500
" " argand burner	" 4,860
Kerosene oil, large round burner.........	" 3,360
" " small flat burner...........	" 7,200
Paraffine candles.........................	" 9,200
Wax candles	" 7,960
Stearine candles.........................	" 8,940

From this comparison it appears distinctly that illumination by electricity is best when refrigerating rooms of every kind; the heat Q_c generated by the same may be disregarded, as against the values Q_a and Q_b, treated before, while illumination by kerosene, and more so by candles, must be considered very prominently in the calculation of room refrigeration as sources of considerable generation of heat.

Second.—The refrigerating capacity required for the cooling of the fresh air to be inducted into the rooms may be determined after the quantity of the change of air, and the outside and inside temperature

are known. The volume of fresh air required hourly differs according to the purposes for which the rooms are used, and depends upon the moisture, organic exhalations and carbonic acid produced by respiration and illumination. The last named, carbonic acid, according to Pettenkofers, is ordinarily used as a gauge for the others named; and $\frac{1}{10000}$ carbonic acid contained in the atmosphere of dwelling rooms, and $\frac{1.5}{10000}$ for schools and working rooms are considered permissible, for the reason that this indicates, according to experience, the volume of organic admixtures to be within limits not injurious to health, "pure air" containing not to exceed $\frac{7}{10000}$ CO_2. The production of carbonic acid in inhabited rooms can be calculated from the following figures:

A vigorous man generates, hourly, .0186 cbm. CO_2.
A child of ten years " " .01 " "

The average of a family can therefore be placed at .014 cubic meter per head.

Among the different methods of illumination, electricity is, of course, the best in this case also, because it generates no, or (by the use of arc light) only a minimum of CO_2; the other methods of illumination to be considered produce the following quantities of CO_2 per hour and per 100 candle power:

	Cubic Meters.
Stearine candles	1.35
Kerosene, flat burners	5.68
Kerosene, round burners	6.16
Illuminating gas, split burners	9.28

The fresh air inducted from outside carries $\frac{4}{10000}$ CO_2 with it.

The following average quantities of air change required have been recognized as proper:

	Cubic Meters Per Capita per Hour.
In hospitals, according to the nature of diseases treated	70-100
For epidemic diseases	150
In theaters and concert halls	40-50
In schools for children	15-20
In schools for adults	25-30

For ordinary dwelling rooms it is the accepted rule that the volume of air to be inducted each hour should fill once to twice the space of the room; this rule is also in accordance with the experience that with such air movement a ventilation free of draft is possible without special precautionary measures.

The amount of refrigeration required for the cooling of the fresh air is easily determined, after the volume of air has been fixed, assuming the difference of temperature to be accomplished, upon the basis of the specific heat of the air. For changes of condition, the last named, under constant pressure, amounts to $C_p = .2377$, which means that in order to reduce the temperature of one kilogram atmospheric air by 1° C., .2377 cal. must be withdrawn from the same. As one cbm. air weighs 1.293 kg., it is necessary to withdraw for each cbm. $1,293 \times .2377 = .31$ cal. per 1° C.

In the above illustration by figures the amount of refrigeration required for the cooling of the air has to be calculated as follows: The assumed space of the four rooms is $164 \times 4 = 640$ cbm. If the air is to be changed completely just once in one hour, and at the same time reduced in temperature from 36° to 18° C., the ventilating apparatus has to withdraw per hour—

$$Q_2 = 640 \times .31 \times 18 = 3,570 \text{ cal.}$$

(With a double change of air twice this amount.)

Third.—But at the same time it is necessary, as already emphasized, to reduce the absolute amount of moisture contained in the fresh air; or, in other words, a part of the moisture contained as vapor in the air drawn in by suction must be condensed to liquid and carried off. The so called latent heat of the water is thereby set free and must be removed by the cold air ventilation; for each gram of vapor deposit this heat amounts to .61 cal. Let M stand for a given volume of air in cbm., S for the weight in g. of the moisture contained in one cbm. of saturated air, and R for the relative moisture. Let index $_1$ designate the original and $_2$ the final condition, and the volume of heat to be removed, owing to the formation of water on the cooling system, will be—

$$Q_3 = M\,(S_1 \times R_1 - S_2 \times R_2) \times .61 \text{ cal.}$$

If we apply the operation of an effective cold air ventilation, as represented in the preceding article, to our present example, we obtain Q_3 as the refrigerating capacity required for drying the air, the original relative moisture taken at 40 per cent, and in order to bring about a favorable final condition, it is necessary, in this case, to reduce the temperature of three-fourths of the total volume, *i. e.*, 480 cbm. per hour, to about 0° in the air cooling apparatus; during this process the air is saturated with vapor, the greater part of which is eliminated as water. The heat of evaporation set free thereby is (the table in the preceding article being used as basis):

$$Q_3 = 480\ (41.34 \times .4 - 4.84 \times 1)\ .61 = 3,420 \text{ cal.}$$

After warming the air in the channels and along the ceilings to 12° C. and mixing with the remaining volume of fresh air, 160 cbm. at 36° C. and 40 per cent moisture, there results a room temperature of 18° C. and the relative moisture.

$$\frac{\frac{3}{4} \times 4.81 + .\frac{1}{4} \times .4 \times 41.34}{15.25} = 0.5$$

In order to preserve this condition of the atmosphere of the room, a cold air ventilating plant answering all requirements must furnish a total amount of refrigeration during the hottest hours of the day, comprising the following items:

$$Q_1 = Q_a + Q_b + Q_c = 9,800 + 650 + O = 10,450 \text{ cal.}$$
$$Q_2 = \ldots\ldots\ 3,570\ \text{"}$$
$$Q_3 = \ldots\ldots\ 3,420\ \text{"}$$
$$\text{Total} \ldots\ldots\ 17,440\ \text{"}$$

After determining the greatest amount of refrigeration to be produced by the cooling plant it must, of course, be determined in each individual case, what fluctuations the refrigerating requirements are subjected to during the course of the day, and over how many working hours the entire refrigeration required for twenty-four hours is to be distributed; also, in how far it may be feasible, with limited hours of operation, to store cold, either in a capacious salt water cooler, or by the formation of ice on the air cooling system. Certain peculiarities will appear with each single case, according to climate, nature and object of rooms, and other considerations.

With the above general observations, however, the solution of every task pertaining to the subject under discussion will be an easy matter, when the local conditions are known and a correct basis is furnished for the details of the plant. It also depends upon such considerations as these: What construction

is best adapted for the single parts of the cooling plant? Shape and length of the air conductors for warm and cooled outside air and for the air consumed are decisive as to whether a ventilator is required to overcome the resistance caused by movement of the air, or whether the differences of density are sufficient to keep up the air circulation.

The difference in temperature between the outside air and the inside air decides the question of profit in an appliance for the exchange of heat (regenerator) by the proper circulation of the fresh air and the air consumed. With the large difference of temperature of 18° C., which forms the basis of our illustration by figures, such appliance may be considered profitable. Among the various parts of the cooling machine, the refrigerator particularly may be constructed in different forms. It stands to reason that, in the case of plants operated chiefly by inexperienced hands, the indirect air cooler (with transmission of cold from expansion of ammonia to the air by means of brine) merits preference over the direct expansion air cooler, being, however, more complicated in construction, but far easier and safer to operate; the advantage of the direct cooler, that owing to the smaller resistance of heat transmission, a higher evaporation temperature can be produced, resulting in more effective force, is neutralized by the fact that, owing to the poorer transmission of heat from steam to iron than to liquids, larger pipe surface must be combined in the direct cooling system, than in the brine pipe cooler. Whether, when brine is used for transmission, pipe coolers are entitled to preference over the cooling tower apparatus, is an open question. Although it may appear surprising at first, the fact that the drying process of the air is at least as effective during the cooling on the surface of cold brine, as on the surface of pipes, is well founded in physics. For a drying surface is one, where the tension of the vapor is less than that of the air admitted. Solutions of salt, cooled to below zero, possess this quality, also dry ice (below 0°), but not melting ice, *e. g.*, natural ice, or pipes wet with water deposit; these are, therefore, better qualified and more effective as drying apparatus, when they are covered with hoar frost than with dew drops only. Particles of dust and microbes, furthermore, adhere better to the ice crystals, becoming completely inclosed by the forming ice, and being removed with the same during the thawing of the refrigerating coils. It is, of course, necessary to provide dripping pans, properly arranged in the chamber of the air cooler, to collect the water from the melting ice, and to prevent the same from flowing into the air shafts, together with the injurious germs contained therein.

There is an apparent economic disadvantage connected with the use of frost covered refrigerating pipes as against brine surface, because the latter requires only the removal of the heat due to the condensation of vapors, while the first create the additional necessity of carrying off the heat set free by freezing during the ice formation. This, however, is met by the advantage that a valuable stock of refrigeration is produced by the ice formation, which can be made available for the continuance of the air cooling for some time after the cooling machinery has been stopped for the day. If we consider further that the brine, owing to the continuous deposit of moisture from the air, becomes more diluted all the time, and finally loses all usefulness for its purpose, provided the process of evaporating and concentrating the solution—a process much too complicated for plants of this kind—is not resorted to in time, it would appear that for room cooling the pipe air coolers are to be preferred, as against the brine tank coolers.

RESIDENCE COOLING IN ST. LOUIS.

By ALFRED SIEBERT, C.E.

I HAVE read the article of Prof. E. Brueckner with great interest, in which he treats the cooling of rooms for dwellings, as published in ICE AND REFRIGERATION. I have done the same thing here in St. Louis at the home of Mr. Pierce, president of the Walter Pierce Oil Co., but in a much cheaper manner, using simply the indirect heating system already in the house.

We have not attempted to cool the air below 70° F. for the reason that we did not want to precipitate moisture, which makes the process entirely too expensive, and there are very few days when air cooled to 70° mixed with the air in the room will be too moist. The fact is, that supplying every quarter of an hour a fresh quantity of air at 70° to the rooms was perfectly satisfactory to the residents.

It is evident that if even one-half of the quantity of air must be cooled to 32° F., the heat of condensation and freezing must be abstracted, which we have entirely avoided and yet obtained satisfactory results. It takes about one thermal unit to cool fifty-two cubic feet of air 1° F.; or to cool the same amount of air from 90° to 70° will require twenty thermal units; and if the air has 50 per cent moisture no condensation will take place, and even at 60 per cent the condensation will be very little. Neglecting the small amount of heat required to cool the water vapor, we have in the St. Louis case, with 50 per cent moisture—

To cool fifty-two cubic feet 20°...............20 Th. U.

In the German case:

To cool twenty-six cubic feet 90°—32°=58°..	29	Th. U.
To condense (0.00212—0.00031)=0.00181 lbs.		
Assuming latent heat—1000.............	49	"
To freeze 26 × 0.00181 × 142 lbs...............	8	"
Total..............................	86	"

or nearly four and one-half times as much.

Of course this St. Louis result is not quite as good as is obtained by cooling one-half of the air to 32°; but since it fills the bill it is certainly cheaper in first cost and in running expenses, and brings air cooling within the reach of many people, while few can afford to employ the other process.

Of course for hospitals, in their fever rooms, where not only a certain temperature, but also a certain per cent of humidity, is required, the mixing alone will not do, but an actual heating of the cooled air must be resorted to.

In Mr. Pierce's house there is a system of indirect water heating radiators located in ducts, over which air is led by natural draft in winter. In the summer water of 60° F. is forced to the radiators (by no means colder, to prevent condensation as much as

possible, and also freezing; and the air is blown over these coils into the ducts and from them distributed to the rooms.

Mr. Pierce has only a 3-ton machine, and cools with it his library, [illegible] room, a large [illegible] and [illegible] a number of [illegible] [illegible] and [illegible]. [illegible] [illegible].

The amount of air to be cooled was 6,000 cubic feet per [illegible] one-half of a ton, while if 25,000 cubic feet had been cooled to 32°, it would have required about two and one-fourth tons; this, of course, would have required a larger machine, as the machine is run only twelve hours every day, and therefore performs only one and one-half ton per twenty-four hours.

In the above arrangement the only additional expense was the very small open air water cooler, small rotary pump driven by electricity, and the fan. As far as I remember, the cooler was four feet long, and consisted of six 1½-inch pipes.

The above shows that it is entirely wrong to cool to 32°, and to prevent this no brine, but sweet water, should be used. This can be brought to 34° or 36°, and will accomplish all that is needed for the most fastidious, but prevents the formation of ice and the consequent loss of heat by freezing.

It will be noticed that in Mr. Pierce's house the cooling effect was not only obtained by artificial cooling, but also by a very slight breeze, the same as a fan, which cools even if it moves saturated air; and I suppose this was mainly the reason why agreeable results were obtained, even in moist weather.

LEGAL MATTERS.

LIABILITY UNDER AGREEMENT FOR ICE USED—FIRE RISK OF PROPERTY BUILT ON RAILWAY LAND UNDER CONTRACT.

Legal Decisions of Interest to the Ice and Cold Storage Trades, Specially Reported for Ice and Refrigeration, by J. L. Rosenberger, LL.B., of the Chicago Bar.

LIABILITY UNDER AGREEMENT FOR ICE USED.

AN important legal principle underlies the recent decision of the third appellate division of the Supreme court of New York, in the case of *Banker* vs. *Willard and Stockamore*, although this was an action brought ostensibly to recover only a trifling sum. The action was based upon a written agreement for the delivery of ice at stated prices during the years 1898 and 1899. One clause of the agreement read as follows: "And the said Willard and Stockamore, in consideration thereof, agree to pay said Albert M. Banker the said prices for all ice used by them for and during the years 1898 and 1899." The complaint, after reciting this, then alleged that after the execution of this agreement "the defendants have received and used 1,500 pounds of ice, of the value of $2.62, which they have not paid this plaintiff for." The complaint did not, however, allege that the plaintiff delivered this ice, or caused it to be delivered, and left it for any inference the literal language of the contract permitted. The proof was undisputed, and established that the defendants did use, after the contract was made, 1,500 pounds of ice; but it also conclusively showed that this ice was not delivered by the plaintiff, but was purchased by the defendants from other parties, perhaps in violation of the terms of the contract; and the proof also showed that the defendants had paid the plaintiff for all ice delivered by him. In the county court the plaintiff secured a judgment, but this is now reversed by the appellate division, [illegible] New York Supplement, 447. In view of the proofs and the peculiar wording of the complaint the court thinks that the county judge gave an erroneous construction to the cause of action in holding that the plaintiff sought to recover for ice delivered by himself, while it thinks it quite plain that he construed his contract to mean that the defendants must pay him for all ice they used, whether procured from him or from others, and that his action was to obtain pay for ice, at the contract price, furnished by others. That this contention could not be maintained, the court insists, needs no argument. The plaintiff might have a right of action against the defendants for a breach of the contract, but the measure of his damages would not necessarily be the contract price of the ice. No proof of actual damages, if any suffered, was offered, which, the court leaves it to be inferred, would be the measure of damages for a breach of contract.

FIRE RISK OF PROPERTY BUILT ON RAILWAY LAND.

The Supreme court of the United States has rendered a decision bearing upon the legal right of a railway company to stipulate, in a lease of land for a cold storage warehouse, against all liability for any loss or damage by fire, in the case of the *Hartford Fire Insurance Co.* vs. *the Chicago, Milwaukee & St. Paul Railway Co.*, 20 Supreme Court Reporter, 33. Action was brought against the railway company for the loss by fire (caused by sparks from its engines) of a cold storage warehouse and the goods therein, owned by a commercial partnership. It was brought by insurers of the property, which had paid to the partnership the greater part of the loss. The right of the insurers, so acquired by way of subrogation, as it is termed, was but the same right that the partnership had, limited to the extent of the amount paid as insurance.

This warehouse, as many another, stood upon a strip of land belonging to the railway company, by the side of its track. The right to erect and maintain a cold storage warehouse thereon had been acquired by the partnership above mentioned through a lease from the railway company, at an annual rental of $5, and upon the express condition that the railway company should be exempt and released from all liability for damage by reason of any destruction or injury of said warehouse or of any personal property therein "by fire occasioned or originated by sparks or burning coal from the locomotives, or from any damage done by trains or cars running off the track, or from the carelessness or negligence of employes or agents of said railway company." This stipulation the railway company set up here for its defense.

The decision of the case was made to turn upon the question whether a provision in a lease, by which a railway company is not to be liable for damage to a building and its contents by fire from its locomotive engines, owing to the negligence of itself or its servants, is void as against public policy. The Supreme court of the United States holds that it is a question to be determined by the statutes and decisions of the

state in which it arises, and that in Iowa, where this case arose, such a stipulation is lawful, and protected this company. Generally speaking, says the court, the right of a railway corporation to build its road and to run its locomotive engines and cars thereon, within any state, is derived from the legislature of the state; and it is within the undisputed powers of that legislature to prescribe the precautions that the corporation shall take to guard against injuries to the property of others by the running of its trains, as well as the measure of its liability in case such injuries happen. But it denies that a railway company is obliged, or can even be compelled by statute, against its will, to permit private persons or partnerships to erect warehouses or similar structures for their own benefit, upon the land of the company. And when the lease was made in this case, it holds that the public had no interest in the question which of the parties to the contract should be ultimately responsible for damages, except such as were covered by the lease.

PROFESSOR PATTERSON ON LIQUID AIR.

BEFORE a meeting, last month, of the Northwestern Association of the Massachusetts Institute of Technology, at Chicago, Prof. George W. Patterson, junior professor of physics of the University of Michigan, gave an address on some of the uses and limitations of liquid air. This was about the time that Professor Tripler was giving his public lecture on liquid air at Chicago. It was asserted that Professor Tripler had refused to furnish the liquid to the Association, as "his laboratory was busy in getting enough of the product for use in his Chicago experiments." The price quoted was named at about $5 per gallon. It was also stated that an invitation to Professor Tripler to be present at the meeting of this Association, which is composed of men of ability in technical matters, was refused. Professor Patterson said in part:

Many absurd claims have been made by ignorant or unscrupulous persons as to the value and use of liquid air. Some of their claims have been made the basis for speculation in the stock of companies formed to use liquid air. My notice has been called to an article in a magazine, in which Mr. R. S. Baker quotes Mr. Tripler as saying with reference to running an engine with liquid air in place of steam to operate a liquid air compressor: "If I could produce only two gallons of liquid air from my liquefying machine for every two gallons I put into my engine, I should gain nothing at all; I should only be performing a curious experiment that would have no practical value. But I actually find that I can produce for every two gallons of liquid air that I pour into my engine a larger quantity of liquid air from my liquefier. I have actually made ten gallons of liquid air in my liquefier by the use of about three gallons in my engine. There is therefore a surplusage of seven gallons that has cost me nothing, and which I can use elsewhere as power"—*i. e.*, perpetual motion. After allowing this to stand for nearly a year Mr. Tripler denies it. The view of physicists in denial of the possibility of the truth of the above statement is well stated by Lord Kelvin, when he says: "It is impossible by means of inanimate material agency to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of surrounding objects." This statement applies to work in cycles. If any one can do what Mr. Tripler is reported to claim to do, then the second law of thermodynamics has been repealed. If the above claim is valid, the simplest proof is the doing of it.

But beyond claims which seem to us absurd there are many suggestions for use for liquid air which may well interest the world. It might be used as power in liquid air engines in places where other power could not be used. The exhaust from the engine might be utilized to produce a moderate amount of refrigeration. As power for submarine boats it is ideal, for the air, after driving the engine, could renew the atmosphere of the boat. The use of liquid air in surgical work appears to be great.

The commercial interest in liquid air is centered in uses for power and refrigeration. I have made careful computations as to the use of liquid air for power. For instance, suppose we take a pound of liquid air and confine it in the cylinder of an engine until its temperature has risen by outside heat to that of the room. The pressure on the piston becomes 800 atmospheres, or nearly six tons a square inch. Allow the engine to begin to do work so slowly that the temperature of the cylinder and inclosed air does not fall materially. The work done by the engine would represent one horse power for five minutes if we have no losses due to friction, fall of temperature, leaks, etc.

If, on the other hand, we allow a more rapid expansion, with consequent fall of temperature, and suppose no heat is communicated to the air from the cylinder, the return would be only about one-third as much—say, one horse power for eighty seconds a pound of liquid air. In any practical motor it would be impossible to use pressure of 800 atmospheres, and there would be losses, and I estimate that we could hardly expect the motor to yield much more than one horse power minute a pound of air, or at most two horse power minutes. This means a consumption of thirty to sixty pounds of liquid air a horse power.

The usual steam engine takes, say, thirty-five pounds of steam a horse power hour, and triple expansion engines take about thirteen pounds. A pound of steam costs one-twenty-fifth of a cent for coal fuel; a pound of liquid air costs to-night fifteen cents. It is a commercial question: Can this cost be reduced to compare with the cost of coal-made steam? I doubt it. And another question: Are there uses for liquid air for power when the user will pay the difference? I doubt it. For refrigeration it is about as bad. One and one-half pounds of ice is as good as one pound of liquid air. Can they be delivered at equal prices? I doubt it.

TOO MANY APPLES IN COLD STORES.

THE comparatively inferior apple crop of 1899 gave promise of fair prices for cold storage stock in 1900, which is not being realized. This was due partly to poor quality of much of the fruit, and to the mild weather of the winter, but also largely to errors in studying the possible markets. According to recent reports there were in February, in the United States, about 950,000 barrels of apples remaining in storage, as against 650,000 barrels the same period of 1899. In New York there were 213,000 barrels in cold storage, and 165,000 in common storage, against 134,250 in cold storage and 94,400 in common storage in February, 1899. This country raises and stores more apples than the home markets will readily consume, hence foreign markets must be sought. But it is a matter of constant complaint by United States consuls abroad that American shippers fail to study the requirements of the foreign markets, and are great losers in consequence. The prevailing system of packing apples in barrels with fine selected stock at top and bottom and along the sides, but with inferior stock rolled in, regardless, in the middle, is not tolerated in the English markets. Much larger prices are paid in London for apples of uniform size, packed in square or oblong boxes, than for even superior apples, packed according to the American plan. The cold storage men who will inaugurate a change in the manner of packing, to conform with foreign standards and customs, and persist in this till they can overcome the prejudice due to past errors, will no doubt secure a profitable market for all their cold storage stock for many years to come.

There has also been much complaint this season of apples rotting very soon after being taken out of cold storage. An expert on fruit storage recently stated that the chief cause of decay in fruit taken out of cold stores is the too rapid change from a low to a high temperature. The effect upon the fruit is similar to that upon a frost bitten ear or nose brought suddenly into a warm temperature.

[*Abstracted from* BRITISH REFRIGERATION.]

COLD STORAGE IN GERMAN ABATTOIRS.

PUBLIC SLAUGHTER HOUSES POPULAR—NEED OF COLD STORES—TABLE OF CAPACITIES—RELATIVE VALUE OF COOLING MACHINES—ADVANTAGE OF BRINE SURFACE COOLING.

By CONSTANZ SCHMITZ, ENGINEER, BERLIN.

SINCE the establishment of public abattoirs in Germany and the introduction of inspection of meat, and since slaughterage has become compulsory, which is now in most states regulated by law, the smaller, and even the smallest towns are aspiring to the establishment of public slaughter yards, so that private and house slaughtering is being abolished. The advantages of local control of slaughtering are very apparent, but against this control for new slaughter houses being built is the expense. In all public abattoirs cold chambers should be provided for preserving the meat. The meat in a fresh slaughtered condition is not palatable, and must in all cases hang several days in order to let it attain the necessary flavor. Cold storage is especially necessary in summer, and, if possible, only in specially adapted storage rooms, in which the air must be dry and cool, in order that the meat should not spoil. Small towns and villages, especially, should be provided with cold storage rooms since the meat has to be kept for a greater length of time than in large towns. In such cases the butcher can take any favorable opportunity for buying his cattle and storing the dead meat, which he otherwise would have to sell immediately. The conditions which must be observed in cold stores relate chiefly to the air, which must be cooled and dried through the cooling apparatus, and which must be at a temperature of from 35° to 37° F., and from 70° to 75° relative moisture. This is attained by circulating a portion of the air through the cooling chamber, by means of fans, which is usually cooled to 35° F., the air brought to the corresponding moisture. It returns again into the cool chamber, and this strongly dried and cooled air combines with that in the cool room, so that the mixture has the above mentioned properties. In what follows it is my intention to show in what manner and form the systems of meat refrigeration are at present conducted. The matter, unfortunately, can make no pretension to completeness, but the following rough sketch will represent, with slight errors, a picture of scientific cooling of meat preserving chambers in Germany. In the following group slaughter house refrigerators connected with slaughter houses are described, while the cooling chambers are such as are found in use by butchers, restaurant keepers, canteens, etc. Some of these arrangements should really be classed as for use by export and wholesale butchers, and not in slaughter yards, but they are found in the possession of private persons, and should really come under the second division. Refrigerators are classed in the order of their hourly refrigeration in calories of their applied engines, and on the basis of the cooling chamber is estimated the corresponding refrigeration which the machines can produce. At most slaughter yards ice is manufactured along with the cooling of the storage chambers, and cold production in these cases is correspondingly smaller.

From the following table it can be seen that the public slaughter house refrigerators have powers from 3,500 to 700,000 calories, corresponding to 25 to 6,500 meter superficies. The private cooling meat chambers work with machines from 500 to 50,000 calories, corresponding to a superficies of three and one-half to 400 square meters. Of the 185 public slaughter houses, 150, or 82.2 per cent of them work with the ammonia machines, and twenty-three of them, or 12.4 per cent, with carbonic acid machines, and ten,

Capacity per Hour in Calories.	Cooled Space in Square Inches.	Slaughter House Refrigerator Houses.			Meat (Cooling Places) Refrigerators of Butchers, Etc.		
		NH_3	CO_2	SO_2	NH_3	CO_2	SO_2
500— 1,000	3, 5— 7	..	..	..	..	..	..
1,000— 2,000	7— 15	..	..	..	..	6	..
2,000— 3,500	15— 25	..	..	..	1	..	..
3,500— 5,000	25— 40	10	..	..	5	20	..
5,000— 15,000	40— 115	25	1	1	7	4	..
15,000— 25,000	115— 200	53	5	4	3	33	..
25,000— 50,000	200— 400	30	8	1	1	39	..
50,000—100,000	400— 850	11	4	4	..	8	..
100,000—150,000	850—1,250	9	2	..	..	8	..
150,000 200,000	1,250—1,600	6	..	..	..	..	..
200,000—300,000	1,600—2,400	3	3	..	..	..	..
300,000—500,000	2,400—4,500	4	..	..	..	..	..
500,000—700,000	4,500—6,500	1	..	..	..	..	..
Total		152	23	10	17	118	..
			185			135	
	Per cent	82.2	12.4	5.4	12.5	87.5	..

or 5.4 per cent with sulphurous acid machines. This proportion is completely reversed in the case of private cooling chambers, of which there are altogether 135. Of these only seventeen, or 12.5 per cent, work with ammonia machines, while 118, or 87.5 per cent are driven with carbonic acid machines. Refrigerators using sulphurous acid are unknown to me in this class. I may point out that ammonia machines for the larger cooling houses, and, on the contrary, carbonic acid machines for the smaller, are the most profitable. The large use of ammonia machines in public slaughter houses tends chiefly to show that the firms which have supplied those machines were producing, unconsciously, an irreproachable working plan for the establishment of carbonic and sulphurous acid machines. There is also a certain prejudice against the two latter machines which must be taken into account, as well as the fact that public bodies are always inclined to give the preference to a system which has been established, and which they have inspected and found satisfactory. The very limited number of sulphurous acid machines in existence may be explained by stating that in Germany those machines were not constructed in good working order until lately, and therefore cannot compare with the ammonia and carbonic acid machines. Otherwise we must state here particularly, as we have stated already so often, that these three systems are equally well suited for the cooling of meat store rooms. Whether one of these systems, in a special case, is not practicable can only be proved after a special investigation into the particular case, otherwise the three systems may be said to be of equal value. The three are made on the compression system. As far as I know there are in Germany only four meat cooling

arrangements in which the absorption system is in use. These four arrangements are for simplicity's sake mentioned among the ammonia machines. It might be of special interest to know the manner in which cold air is transferred to the ordinary air in these machines. The machine consists of a cooling coil in which the cooling medium evaporates, a compressor which compresses the gas, and a condenser in which the gas is again liquefied by the abstraction of the heat through the cooling water flowing over the condenser, and of a regulator which again supplies the cooling coils with the necessary quantity of the liquefied cooling medium. As the air in the meat cooling chambers must not only be cooled down but dried as well, a great part of the moisture contained in the air must be separated. As the air in its circulation through the cooling chamber rises to higher temperatures, it constantly receives moisture from the meat, as it is meant to do, so the drying of the air must not only be momentary, but constant throughout the whole process of cooling. Generally, the whole of the air in the cooling chamber is circulated ten times per hour. In old fashioned arrangements the air cooling was carried out by pipes placed in the rooms to be cooled, using either direct expansion or brine circulation. In the indirect system, a solution of salt was cooled to a low temperature, and this with the aid of a special pump was circulated through the cooling pipes of an air cooler. The cooling pipes are built in a recess generally constructed of brickwork, well insulated. The air of the cooling chamber in passing these cooling pipes is cooled, and at the same time gives away its moisture in the shape of crystals on the surface of the cooling pipes. To assist the production of cold air in the cooling chamber itself, the cooling pipes have sometimes been fixed on the ceiling; but it is clear that these cooling pipes could be dispensed with entirely if the air circulation and the cooling spaces were made larger. The first and oldest system of cooling the air now most adopted is by arranging the air cooler, consisting of the expansion pipes into two separate compartments in order that the current of air can be directed alternately by turning some dampers through one or the other air cooling recesses. In this way one has the opportunity to stop the two air coolers from time to time, in order to melt away the adhering crystals on the surface of the pipes, and thus cause these pipes to conduct more actively. From the sharp cooling of the air the moisture due to the low temperature in which the air is cooled is condensed in very small drops, which naturally adhere to any solid bodies which are in the air, enveloping the same, and carrying with them dust, bacteria, etc., which are thus removed. All the uncleanness in the air is thus removed by the drying process. The air coming through the cooler is not only cooled down and dried, but also cleaned, and all hurtful things are removed. There are other methods by which the air is cooled. In one, the air by coming into contact with the brine is cooled and dried; in this case the expansion coils of the machine are placed either in a special brine vessel or this brine vessel forms part of the air cooler. The cooled down brine must in any case be kept in motion by some mechanism or by a pump. In all arrangements the chief thing is to obtain as much surface as possible for the cold brine, so that the air may be brought into contact with it. The first and simplest apparatus were built in a style of condensing towers, and in them the cold brine was raised by a pump to the upper part of the apparatus, through which it then descended in a rain-like form over shells or tins as the air was directed on the salt water stream. In another arrangement of this air cooling apparatus the salt water is diffused in the air in the shape of fine rain. There is an arrangement by which the surfaces of the apparatus are constantly wetted with freshly cooled brine. In this air cooler, by which the current is brought directly in contact with the surface of the salt water, the drying is produced simultaneously with the cooling down of the air. The drying is accomplished in exactly the same way as on other cold surfaces, namely, the condensation of the moisture contained in the air. As long as the air has a higher temperature than the surface of the cold brine, it has a greater expansion than that upon the cold surface, and consequently, as soon as the air is saturated with moisture in proportion to the decreasing temperature, the surplus moisture is compelled to separate and is discharged upon the cold brine surface. The little drops of liquid dissolve at once in the brine, and are absorbed by it. This is the great advantage of the salt water air cooler over pipe air coolers. As the cooling surfaces cannot freeze they can be kept in constant use. The brine becomes, in consequence of the constant reception of the moisture, weaker, and it is, therefore, necessary, automatically, to keep increasing the concentration by fresh solutions of salt. In smaller cooling arrangements no special air cooler is used, as described above, but the cooling pipes, as in other cold chambers, are laid directly on the ceiling or the walls of the chambers. With the apparatus in which carbonic acid is used, expansion pipes are used in nearly all instances. Cooling is produced in this way as well as by a special air cooler; but in many instances it will not be possible to obtain the required dry temperature, as the moisture arising from the meat is not extracted, but remains in the shape of ice crystals on the cooling pipes. It is, therefore, only separated from the cooling chambers when the machine is stopped from time to time so that the frost on the pipes can thaw and flow off the cold chamber as water. Also the cleansing of the air in this arrangement is not as good as with a separate air cooler, for the frozen surface of the cooling pipes will, after some time, cease to throw off particles of water with their impurities. Then, again, the air gets thick and moist because the meat throws out a constant moisture, which cannot be absorbed any more in the same proportion. Out of the 800 slaughter houses which are in existence at present in Germany, only about 200 work with cooling machines described in the above. New slaughter houses are being built continually, which almost without exception contain a cooling house. It may be taken for granted that the existing slaughter houses will not be able to do without improving their arrangements in this respect, as competition will compel action.

OFFICIAL NOTICES

(OFFICIAL.)

ILLINOIS ICE MANUFACTURERS' ASSOCIATION.

The second annual meeting of the Illinois Ice Manufacturers' Association will be held at the Leland Hotel, Springfield, Ill., on Tuesday, March 6, 1900. Business session opens at 2 P. M. A social session and smoker will be held in the evening.

All ice makers in the state are invited to meet with the members of the Association, as benefits will be derived from the acquaintances there formed and from talking over matters in a social way, or relating the troubles encountered and how these have been met.

C. B. STORER, *President*, Champaign, Ill.
C. C. HACKNEY, *Secretary and Treasurer*, Aurora, Ill.

WESTERN ICE MANUFACTURERS' ASSOCIATION.

KANSAS CITY, MO., February 17, 1900.

The second annual meeting of the Western Ice Manufacturers' Association will be held at Kansas City, Mo., March 14 and 15, 1900, for the election of officers for the ensuing year, and such other matters as may come before it. A general discussion of ice making and distribution will take place at this meeting.

All ice manufacturers in Missouri, Kansas, Nebraska, Oklahoma, Arkansas and Indian Territory, including those not members of the Association, are invited to attend.

Room 16 Armour Building. A. MENNY, *Secretary*.

INDIANA ICE MANUFACTURERS' ASSOCIATION.

The sixth annual meeting of the Indiana Ice Manufacturers' Association and the third annual meeting of the Northern Ice Manufacturers' Association, will meet at Marion, Ind., March 13 and 14, inclusive.

The reading of papers and discussion is and has been of much benefit to ice manufacturers, but there may yet be a great many subjects not thoroughly understood that perhaps can be made clearer, and it is the desire to have this meeting as instructive and interesting as possible.

Hearty co-operation is solicited in the efforts to induce those ice manufacturers in Indiana who are not already members of the Association to come in and join.

PROGRAMME OF THE MEETING.

TUESDAY, MARCH 13.—Opening at 10 A. M., in Commercial club assembly room. Address of welcome by Hon. W. L. Golding, mayor of the city of Marion. Followed by business session of members only.

TWO P. M.—Trolley ride to Gas City, Jonesboro and over city.

NINE P. M.—Banquet, Burrier hotel.

WEDNESDAY, MARCH 14.—Session opens at 10 A. M. General discussion. This meeting will be followed in the afternoon with the session of the Northern Ice Manufacturers.

Headquarters will be at the Burrier hotel.

INDIANA ICE MANUFACTURERS' ASSOCIATION,

MARION, IND. FRED. O. EWARD, *Secretary and Treasurer*.

THE NORTHERN ICE MANUFACTURERS' ASSOCIATION.

The Northern Ice Manufacturers' Association will hold its second annual meeting at Marion, Ind., March 13 and 14, 1900, at the Burrier house. It is intended to make this meeting as interesting as possible. Efforts have been made to secure instructive papers on subjects interesting to the members, and all who have anything they think will be of interest to the Association are requested to correspond with the secretary.

All ice manufacturers in the north not now members of the Association are requested to come and meet with the Association at Marion.

PROGRAMME.

TUESDAY, MARCH 13.—Opening at 10 o'clock A. M. in Commercial club room. Address of welcome by W. L. Golding, mayor of Marion. Followed by business session.

TWO O'CLOCK P. M.—Trolley ride to Gas City, Jonesboro and Marion.

NINE O'CLOCK P. M.—Banquet at Burrier hotel, with the usual toasts.

WEDNESDAY, MARCH 14.—Session opens at 10 o'clock A. M. Opening address by president. After which the following subjects will be discussed: "Best Method of Handling Hard Water in Boilers and Condensers"; "Relative Cost of Gas, Coal and Oil in the Manufacture of Ice"; "Cold Storage Ventilation"; "Plate Ice, Methods and Cost of Manufacture"; "Can Ice, Methods and Cost of Manufacture"; "Report of Natural Ice Crop"; "How to Meet the Competition of Natural Ice." There will be a paper by Alfred Siebert, of St. Louis, on "How Small Ice Plants can be Made More Economical at Small Expense." Also the subject of mutual insurance will be discussed, after which the report of secretary will be made, and then the election of officers for the ensuing year will take place. A cordial invitation is extended to all ice manufacturers to attend.

P. S.—Application has been made for one and one-third fare on all railroads.

ALEXANDRIA, IND. JOHN H. FRANK, *Secretary and Treasurer*.

SOUTHWESTERN ICE MANUFACTURERS' ASSOCIATION.

The annual meeting of the Southwestern Ice Manufacturers' Association will be held on Tuesday, March 13, 1900, at the Oriental hotel, Dallas, Tex.

Extensive preparations have been made for the entertainment of members and their guests. A large attendance is expected, and all ice manufacturers in the southwest not already members, are invited to be present and to join the Association.

E. ARNOLDI,

SHERMAN, TEX. *Secretary*.

A SCHOOL of agriculture under the direction of the Committee for the Promotion of Agriculture is to be established in New York. A farm of 200 acres, thirty-three miles west of New York city, has been secured, it is stated, and it is proposed to erect buildings and plants for experimental purposes. The plan for the buildings includes a modern cold storage plant, where the processes for preservation by means of mechanical refrigeration are to be taught. This is no new plan, as state agricultural colleges or state universities are generally seeking to equip their experimental departments with refrigerating machinery, the value of which was graphically described by Professor Magruder, of the Ohio State university, college of agriculture department, in ICE AND REFRIGERATION for September, 1899. The chairman of the committee having in charge the proposed school in New York is Abram S. Hewitt, with Francis W. Holbrook as secretary. Geo. T. Powell, director of agriculture, William E. Dodge, Hon. Jacob F. Miller, Prof. I. P. Roberts and Prof. L. H. Bailey are members of this committee.

OBITUARY.

——James W. Cochran, son of the late James E. Cochran, one of the founders of the ice business in Baltimore, Md., and formerly president of the Cochran-Oler Ice Co., died in Baltimore on Sunday, February 11, 1900, at the age of forty-two. James W. Cochran entered the ice business with his father and became a member of the Cochran-Oler Ice Co. He was also interested in the Knickerbocker Ice Co. and in the American Ice Co., which succeeded the original company.

——Frank Kaufman, general sales agent at Cincinnati, Ohio, for the Frick Co., builders of ice and refrigerating machinery, of Waynesboro, Pa., died recently in Cincinnati. Mr. Kaufman had been with the Frick Co. for over fourteen years, had put in many plants for them and was highly regarded for his excellent business qualities and integrity. His death will be seriously regretted by the company and by his numerous friends in the ice and refrigerating trades.

ICE MAKERS' CONVENTIONS.

SEVERAL conventions of ice manufacturers' associations are to be held this month: one in Illinois, at Springfield, on the 6th inst.; one in Dallas, Tex., on the 13th; two at Marion, Ind., on the 13th and 14th; and one at Kansas City, Mo., on March 14 and 15. It would not be practicable for any one person to attend all these meetings, although he might obtain valuable information at each of them, their dates being too nearly coincident; yet the fact that so many people will be gathered together in various sections of the country, all actuated by a kindred purpose, must serve to add to the enthusiasm, and stimulate efforts to form fraternal relations, to promote interchange of helpful experiences, and to bring new light upon vexed or imperfectly understood matters relating to the science of refrigeration. Any one of these objects—and they may all be attained by each one attending—is sufficient to warrant the existence of the Association, and to amply repay any one for the time, or the expense, involved, in the effort to attend and take part in the proceedings.

BOSTON'S municipal ice business has not proved a success, according to the reports of the Boston press. It is asserted that this season only about 100 tons of ice have been cut and stored, and that this has cost the city about $6,000. The ice is cut from the city reservoirs by city employes, and is distributed to the public fountains, city offices, etc., by the department. Last year about 1,600 tons of ice was stored, at a cost, per ton, according to the commissioner's reports, of ninety-six cents. It is asserted, however, that the real cost of housing and distributing was far in excess of the amount that would be charged by a private concern, under contract, for the same quantity of ice delivered at the same places. A part of the city ice plant has been sold and, it is stated, the operation of the plant will be abandoned.

TESTS have been made with a refrigerator car equipped with electrical refrigerating apparatus by the Electric Axle, Light and Power Co. This company was incorporated with a capital of $25,000,000, later reduced to $2,500,000, for the purposes of developing or exploiting the merits of the Ryan system of securing power from the axles of moving cars. The apparatus which is to gather this electric force and furnish the refrigeration is attached to the bottom of the car body, and weighs, it is stated, 3,000 pounds. Great economies will be possible if the apparatus will do, practically, what its sanguine inventors claim it will do or has done in experiments with models. The apparatus on the trial car in its run from New Orleans, La., to Montgomery, Ala. (320 miles), maintained the temperature, it is said, at about 30° F., but was declared to be still imperfect in detail. The company was organized last summer, an account of which appeared in the August issue of ICE AND REFRIGERATION.

—"If you can't keep our name in your head, keep it in your hat," is the legend upon a most unique little advertising novelty of the Vilter Manufacturing Co., of Milwaukee, manufacturers of ice and refrigerating machinery. A miniature hat brush is mounted upon a thin sheet of aluminum, curved to fit inside the sweat band of the hat.

COLD IN DEATH.

THE dead body of a man, supposed to be that of Stuart St. Clair, was found in a refrigerator car at Eaton, Colo., a couple of weeks ago. Mr. St. Clair had written his wife from Dallas, Tex., that he was going to Fort Worth to commit suicide. The car in which the rigid body was found was from that place, and the description of the body answered to that of Mr. St. Clair, so that there seems but little doubt that it was he. Mr. St. Clair was well known from his connection with the York Manufacturing Co., and later with the De La Vergne Refrigerating Machine Co., and his many friends in the trade will be grieved to learn of his untimely end. He left a wife and two sons to mourn his death.

M. RAOUL PICTET, the well known scientist, is reported to have stated in a recent address, that oxygen could now be prepared by means of a new process in practically unlimited quantities, and at little expense. He is said to have asserted that, with a 500-horse power plant, he could produce daily 500,000 cubic feet of oxygen, 1,000,000 cubic feet of nitrogen and 1,000 cubic feet of carbonic acid gas. The last named product, it was also asserted, would pay for the actual cost of production, leaving the nitrogen and oxygen as profit on the investment. The liquefaction of air was said to be a part of the process. If these assertions are verified the commercial possibilities of the process are by no means inconsiderable.

NOT IN THE TRUST.

ANOTHER evidence of the methods of so called "trusts" is shown in the present trouble over the control of the Excelsior Salt Works at Pomeroy, Ohio. The late owner of the works, Mr. B. Koehler, being then in very poor health, gave a lease of the works to the "salt trust," which immediately closed or "dead rented" the plant. Mr. Koehler's family objected to the lease, and when, after his death, they fell heir to the property, proceeded to open and operate the works, which had always been profitable. Now the "trust" objects and seeks to establish its claims in the courts, which, thanks to the good work of Mr. Monett, attorney-general for the state of Ohio, they will probably fail to do. C. J. Koehler and J. W. Schlaegel, who are operating the salt works, are also the owners of the Eureka Calcium Works, well known to the ice and cold storage trades.

THE provincial board of health of Montreal, Quebec, has adopted the following resolution regarding the restrictions in regard to the harvesting or selling of impure ice:

> The board of health of the province desires to assist in every legitimate way the Montreal health authorities in preventing the use of impure ice as food, and trusts that the provincial by-law now in force—by which the collection, storage and distribution of ice is fully vested upon the municipal authorities—will be strictly enforced. It is unnecessary to add that the provincial board will hold the municipal authorities strictly responsible for any infringement of the said by-law, as well as of the conditions which have to be fulfilled before any dealer be permitted by the municipal authorities to store ice of inferior quality for strictly refrigeration purposes.

ANSWERS TO CORRESPONDENTS.

GASES IN CONDENSER—TO REGISTER AMOUNT OF ICE PULLED—REMEDY FOR LEAKY ICE CANS—FLOAT FOR REBOILER—PICTET MACHINE AS AMMONIA COMPRESSOR, ETC.

[This department of ICE AND REFRIGERATION is conducted for the benefit of the trade generally, as well as individuals; and all competent inquiries will be given timely and proper attention, precedence in all cases being given to such questions as are of general rather than of individual interest. Correspondents will please write only on *one* side of the sheet. Persons desiring to communicate with correspondents using this column will do so by addressing them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago. All communications to this column are treated as confidential, and the names of the writers will not be disclosed without their permission. Anonymous communications will not be answered in this column.—ED.]

GASES IN CONDENSER.

To the Editor: We have a 75-ton compressor 15×30 running at fifty-four to sixty revolutions per minute, discharging through a 3½-inch pipe to high pressure tank. A 4-inch pipe carries the gas from the tank to condenser, discharging in the middle of a 4-inch header connected to the bottom of seven condenser coils twenty feet long, twenty-four pipes high (2-inch pipe). The liquid is drawn off through a ½-inch pipe. A cross-connection with a tee in center between two condensers connects with a manifold (four ½-inch pipes run from each pair of condensers, viz., from the fourth, eighth, twelfth and eighteenth pipe, counting from the bottom of condenser coil), from which the liquid flows to liquid receiver. What we would like to know is: Why does the high pressure run up to 175-180 lbs. in cold weather and 180-210 lbs. in summer with plenty of water at 60°? R. E.

ANSWER.—Most likely your trouble is due to permanent gases in the condenser, and to remedy the same the permanent gases should be drawn off at the top of the condenser coil. It is advisable when drawing off the permanent gases to make the condenser as cold as possible by using an excess of cooling water and by stopping the inflow of ammonia gas to the condenser for the time being. A small hose, or, better still, a permanent small pipe, may be attached to the top of the condenser (and provided with a valve near the condenser), the other end dipping in cold water. If on opening the valve bubbles are seen to escape through the water the valve should be kept open as long as such bubbles appear in noticeable quantity. When a cracking noise in the water indicates that most of the gas escaping through the pipe is ammonia, the valve should be closed. See also chapter on "Management of Compression Plant" in Siebel's "Compend of Mechanical Refrigeration."

TO REGISTER QUANTITY OF ICE PULLED.

To the Editor: Will you kindly answer me in your column of inquiries the following question: Is there a machine or contrivance that registers the quantity of ice pulled daily in an ice plant, can system? That is, I would like to keep the tally, by some mechanical means, of the ice that is pulled daily, same as the recording clock that a watchman carries.

H. E. W.

ANSWER.—Different appliances have been used for automatically registering the number of cans pulled from freezing tanks, but so far as we have been able to ascertain none of them have been infallible.

We know of the following devices having been used to register the number of cans pulled, viz.: First, the ordinary conductor's register, such as are used on street cars all over the country, with the pull cord located convenient to the dumping cradle, so that every time a can is dumped the ice puller rings up. Second, an automatic register on the can filling tube, which registers every time a can is filled, by means of a lever connected to the float and attached to a register similar to a revolution counter. Third, the ordinary watchman's recording clock, operated by a special key, and which punctures a paper dial every time the key is turned in the box. The clock can be locked up in the office, where the can pullers cannot get at it, and the boxes can be located wherever desired, and as many as may be required can be used in connection with a single clock. In our opinion, this is the most satisfactory device, in that the boxes can be attached to the dumping cradle, to work automatically every time the cradle is turned to dump the ice from the can, and it does not depend in the least upon the memory of the man to register after each dumping, and again it registers accurately the time each dump is made, so that in case of the men not pulling regularly at stated intervals of time, as they should do, the paper dial will keep an absolute record in the office, which will give the owners the opportunity of observing any irregularity in the pulling, and place the responsibility for same where it belongs. Of course with this device registering can be prevented by not placing the can on the dump at all, but if the rows of cans pulled are checked out every time a change is made in the watch, it is very difficult to get ahead of the register, and the record of actual time of pulling every can will frequently locate the cause of unequal production, and will cause the ice pullers to exercise care in their work.

REMEDY FOR LEAKY TANKS.

To the Editor: We are having trouble with our brine tank. It is built of cypress wood, and has been in use four years. For the last year or so the salt has been coming through. The insulation around the tank is sawdust, and outside of that is a 9-inch brick wall. The salt comes clear through the bricks, and we are at a loss to know what to do to stop it. Can you inform us what should be done in the matter, and what attention we should give the tank? E. B. Co.

ANSWER.—There are two ways in which your wooden brine tank can be made tight, either of which will answer for a time, but we cannot warrant that either will be a permanent and entirely satisfactory solution of your trouble. *First*, it will be necessary for you to take out of the coils from the tank, and then dry out the wood by placing a salamander in the tank and keeping it burning until all of the surface is thoroughly dry, then swab the entire inside surface with pitch, and over the pitch lay two courses of first-class waterproof, damp course roofing paper, laying the paper one-half lap, so as to break all joints, and thoroughly swabbing between the layers of paper with pitch, and again swabbing over the paper with a thick layer of pitch. To make it sure that the paper will remain in place it would be well to nail lath or battens at short intervals of space all around inside of the tank, both up and down and across the bottom. So long as this inside lining remains in position the tank will be perfectly water tight. *Second*, line the tank inside with heavy galvanized iron, riveted close and soldered at all seams. Either of the above suggested methods will keep the tank tight for a time, but it is only a question of time when either one of the methods will give out. The paper will, in time, loosen from the sides and bottom of the tank, and once the brine gets through the paper the tank will leak as badly as ever. In the same manner the galvanized iron lining will in time rust out, and in either event the

tank will leak again. We only offer the above methods as temporary repairs, to keep the tank in working condition for a season or two, and not by any means as permanent, reliable and satisfactory solutions of your difficulty. We never recommend wooden tanks for brine, as in the majority of instances wooden tanks leak, and once they start leaking they are the source of a great deal of trouble and annoyance. We are aware that a large number of wooden tanks are in use in this country, many of which are said to be perfectly tight, but we have so many reports of leaky wooden tanks that we prefer to recommend heavy iron or steel tanks, close riveted and caulked at all seams, as the most reliable and satisfactory in the long run.

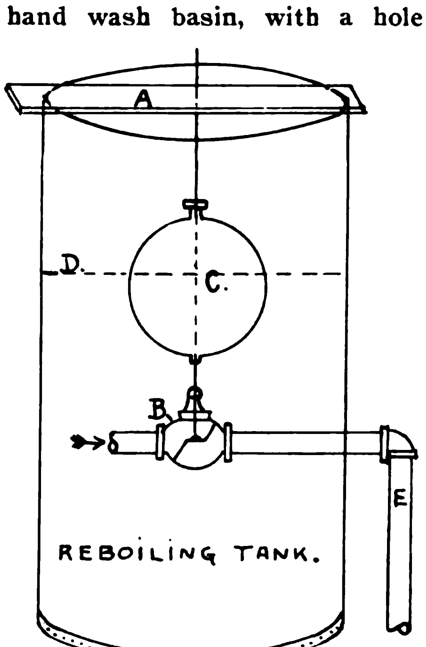
FLOAT FOR REBOILER.

To the Editor: I enclose a rough sketch of our reboiler. What I want to know is, where can we get a good float suitable to raise the valve when the proper amount of water gets in the reboiler? We have had great trouble to get a float that will continue to be air tight. The boiling water appears to cause them to leak and get full of water and sink. If you can give us the information we need will be under very many obligations. The floats we have had were made of copper.

N. F. W.

ANSWER.—Your trouble is a very common one, when a tight float is used in connection with a regulating valve in a chamber containing hot water, particularly so when the float is used in the reboiler. The air in the float necessarily is heated to the temperature of the water, and the consequence is that the float reservoir is under pressure from the inside. It is only a question of time when the float will leak, and when it does it will take in water and cease to be of any use as a float.

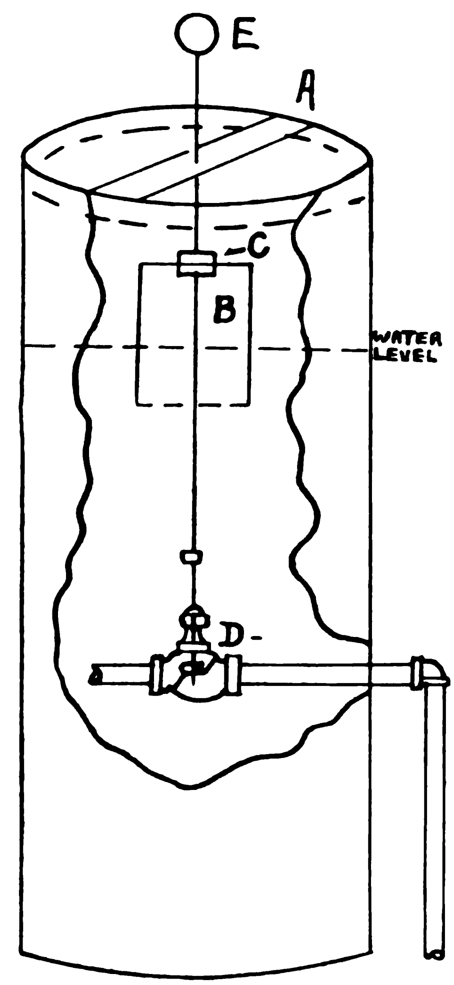
The sketch herewith shows a float that will work under almost all conditions of temperature and pressure. It is merely an inverted bucket or pan, or ordinary hand wash basin, with a hole punched



FLOAT FOR REBOILER.

A.—Guide for valve stem. *B.*—Valve. *C.*—Float to close valve. *D.* Water level. *E.*—Pipe to cooling tank.

through the bottom, just large enough for the valve stem to pass through. The valve stem is threaded for several inches, to allow of the float being raised or lowered to the desired height at which the water is to be carried in the chamber. The float is held in position on the valve stem by means of a pair of lock-nuts, one above and one below the float, with a ring of packing under each lock-nut to hold the float air tight. In operating, as the water level rises in the chamber, the water will force the air up under the float and



BUCKET OR PAN FLOAT.

A.—Guide for valve stem. *B.*—Inverted bucket or pan. *C.*—Lock-nuts with packing between. *D.*—Valve. *E.*—Weight on valve stem.

close the valve as the float rises on the water. When the water level lowers the float will drop and open the valve, provided, of course, that the valve works easily. But if the valve works hard, so that the bucket or pan is not heavy enough to fall and open the valve, then the top of the valve stem must be weighted sufficiently to make the valve open—a little experimenting with various sizes of weights will quickly demonstrate how much the valve stem must be weighted for a given size of float. The pan or bucket is inexpensive, when compared with the cost of copper floats, and if one gives out it is a matter of very light expense to throw it away and replace it with a good one.

It is not good policy to operate a float in the reboiler, where the surface is in constant agitation; it is preferable to put the float in the skimmer, or, better still, have a separate box or tank in which to regulate the water levels.

AMMONIA IN FISH STORAGE ROOM.

To the Editor: Our system for refrigeration is the Linde dry air circulation, and we had a complaint from one of our customers storing fish, that the ammonia had in some way affected the fish. Has any of your patrons ever questioned you in regard to this matter? It seems hardly possible that the ammonia could leak from the refrigerator coils into the air and be driven by the fan into the fish rooms, without it being

noticed in some way. If you have any information in reference to the above please state same in your next number. U. S. C.

ANSWER.—We have never before received any inquiry regarding the bad effect of ammonia on fish in cold storage. We have no idea in what way the ammonia could act in this connection, but are satisfied that if there was sufficient ammonia in the air driven into the room containing the fish, to affect the latter in any way, you would have noticed its presence.

WORKING PICTET MACHINE AS AMMONIA COMPRESSOR.

To the Editor: We again come to you in our troubles. You no doubt know all about our machine, as you have heard from us before. We also have another machine of the Pictet pattern, made about fifteen years ago, that is in as good condition as it ever was. The steam cylinder is 12-inch by 24-inch stroke. The compressor is 10¼ × 24-inch, double-acting. Now we would like to know how to change this compressor so we can work it in connection with our larger machine. We mean in case of a breakdown with one, to go on with the other. We have written to two machine makers, and they both claim it cannot be done, owing to difference in pressure. And both suggest that we throw away our old machine, and buy one from them, which would mean a cost of $2,000 or $3,000, which we do not feel like doing, if we can avoid it. Our engineer, who has had twenty years' experience with ice machines, claims that by "bushing" the compressor it can be made to work ammonia gas all right—of course not as many pounds—but enough to keep our brine below the freezing point to be used in our cold storage rooms until the new machine can be repaired. P. & F.

ANSWER.—Regarding changing your old Pictet machine over, to be operated as an ammonia compressor, would say that there is no reason why it cannot be done practically, and at a reasonably small expense. As we recollect the Pictet machines of fifteen years back, there was more or less in the way of copper and brass material about the compressor. All of the copper and brass would have to be removed and replaced with iron and steel, as ammonia would have a decomposing effect on either brass or copper, while it will not affect iron or steel in the least; consequently in case you make the change, you must avoid the use of any parts constructed of either copper or brass where such parts will come in contact with ammonia. We do not call to mind the sizes of the suction and discharge valves and connections on the old patterns of Pictet machines, but we would say that for proper practical operation with ammonia, the valves and connections for your 10¼-inch compressor should be at least two and one-half inches, and if you can make the valve openings and pipe connections three inches it will be so much the better. The Pictet machines had a hollow piston and piston rod, and water was circulated through the same to keep the piston and rod cool. You must make sure that these parts are perfectly tight if you intend to circulate water through them, as water in the compressor cylinder would have a bad effect on the ammonia; but if the piston and rod were tight for the Pictet liquid and gas it will, no doubt, be all right for ammonia. It is true that you will have to operate under much higher conditions of pressure with ammonia than was the case when operating with the Pictet liquid, but as you had to contend with maintaining a partial vacuum with the Pictet liquid, and had to keep the connections tight as against leakage of air or water from the outside into the compressor, we think that the conditions of higher pressure will be found no more difficult to contend with than were the conditions of partial vacuum. We are sure that the strength of the metals in the compressor construction are ample for the higher pressure that you will meet with in pumping ammonia. We would recommend that you use a water jacket around the compressor and heads, and keep a circulation of cooling water constantly running over the compressor when in operation. As to the ability of your engine to run the compressor when pumping ammonia gas, would say that the comparative areas are as follows, viz:

Engine cylinder, 12-inch diameter of bore, area 115.1 square inches.

Pump cylinder, 10¼-inch diameter of bore, area 82.516 square inches.

Which shows that the engine has about 38 per cent more piston area than the pump, consequently the engine would operate the pump if the mean effective pressure on the pump piston were about 38 per cent greater than the M. E. P. on the engine piston; and as you can carry full boiler pressure on the engine piston to such a point of cut-off, as will make the M. E. P. on the engine piston exceed that on the pump piston, there is absolutely no question but that the engine will drive the pump satisfactorily. We can say that we know of machines in actual operation that are so close to the same areas as above given that the difference is not worth mentioning, and the machines are doing satisfactory work. As you contemplate using the Pictet machine merely for a reserve, and do not intend to operate it all the time, the question of economy does not enter into the proposition as fully as it would if the machine were to be operated continuously, and we think, therefore, that the change you contemplate would be well worth the expense.

THE CARBONIC ACID MACHINE.

To the Editor: It just occurs to me that the operation of the carbonic acid machine can be explained by the expansion of the gas, or is to be found in the following: At the critical temperature CO_2 separates into CO and O, and perhaps CO can be condensed at 100° and about 1,200 pounds pressure. This liquid CO while expanding reduces its temperature, and with it the temperature of the free oxygen, to the critical temperature or below. The oxygen now combines again with the CO gas formed by the part evaporation, requiring heat for this, but finally liquid CO_2, and a great deal of gas CO_2 and CO are delivered to the refrigerant, where the rest of CO and O (about 50 per cent) combine after all CO has evaporated. If you have any data about ammonia temperature, for the critical temperature and pressure of saturated CO, let me have them. R. E.

ANSWER.—Your proposition regarding the dissociation of carbonic acid at its critical temperature is entirely at variance with the scientific tenets as held to-day, and without any precedence whatever; moreover according to the observations of Deville, the partial dissociation of carbonic acid (CO_2) into carbonic oxide (CO) and oxygen (O) does not commence below 1,300° Celsius. The critical data and other physical constants of carbonic oxide are mentioned in the table on page 272 in the third edition of "Compend of Mechanical Refrigeration." The reason that you did not find them is probably due to the fact that you looked for them in the chapter on gases in the beginning of the book, but that portion had been printed already when the author of the Compend came across the last mentioned table, and therefore he was obliged to place it in the newly added chapter on the liquefaction of gases—a nearly related topic.

REMEDY FOR LEAKY ICE CANS.

To the Editor: Having discovered that some of our ice cans are beginning to leak, we write for information as to the best method, if there is any, of repairing same. We thought of painting the outside of all our cans with red lead and boiled linseed oil, as a preventive against the action of the brine. Last year we had occasion to make a thorough overhauling of our ice tank, and in order to save our brine we pumped it into our cans. Could the brine in any way have seriously affected the inside of the cans? H. I. C.

ANSWER.—As to the best method of repairing leaky ice cans, would say that in our opinion the best way, and, in fact, the only satisfactory way, is to thoroughly clean the cans and solder all leaks carefully, testing the cans after the repairs, by either filling them with water or by immersing them in a tank of water before putting them in service again. Almost every ice maker employs a man who is competent to do a good job of tinsmithing, and if the cans are taken care of by such a man the cost of the repairs will be comparatively light, and the cans will be kept straight and tight. One of the most frequent causes of leaky cans is due to the cans becoming bent, twisted or bulged, through rough handling, and then every time the ice is removed from the misshapen can the ice pullers have either to thaw off a considerable percentage of the ice more than is necessary under proper conditions, or else hammer the cans on the dump to loosen the ice from the can, the latter frequently springing the seams and causing the cans to leak, as well as spoiling the shape of the cans. When cans are so bent out of shape they should be straightened at once, and it pays to have a man on the premises who can do such repair work on the cans.

We think that the fact of your having filled the cans with brine, when emptying your tank, has had no material effect on the cans; putting the brine in the cans, when necessary to remove the coils for cleaning or repairs, is common practice, and we have yet to learn of an instance where it has resulted to the detriment of the cans. Of course after brine has been stored in the cans it is absolutely necessary that the cans should be thoroughly cleaned out, to remove any salt that might cling to the interior, before using the cans for freezing distilled water, as presence of salt in the cans would certainly produce white ice. We would also think that if the brine were emptied out and the cans allowed to stand wet with salt water for any considerable time it might result in oxidizing the galvanized coating of the cans; but if the cans are cleaned and dried immediately after being emptied of the brine, we would not look for any material detrimental effect on the cans. The cans are immersed in brine, and if the brine does not affect them on the outside it should not affect them materially if brine is put into them once in a while. You will find several "can paints" advertised in our columns, all of which are recommended by users for preserving cans, and some claim that their paints will stop leaks, as well as prevent corrosion.

CONNECTING FREEZING TANK COILS.

To the Editor: Would you kindly inform me through ICE AND REFRIGERATION if I can successfully make proposed changes with freezing tank coils? I have a Frick compressor 6×8 inches, running at ninety-two revolutions per minute; have two sets of 1¼-inch coils in one tank; total amount of 1¼-inch coils 1,056 feet; expansion at bottom and suction at top of each set of coils and connected to one 1¼-inch suction pipe to compressor. The piping is so constructed that the expansion valve connects to bottom pipe of first coil, rises to top of first coil and is piped to bottom of next coil, and so on for each half of tank. I propose to connect expansion at top and suction at bottom, and connect both coils together so I will only have one expansion valve and one suction pipe, and the ammonia will have to travel through 1,056 feet in tank and twenty-six feet between tank and machine—all 1¼-inch pipe; for above fifteen pounds back pressure causes pipe to frost to machine the way it is piped at present. T. E. T.

ANSWER.—It is all right for you to connect your expansion pipe so as to have only one expansion and one suction pipe. The latter, however, as well as the feed manifold, connecting as they do the different coils, should be of larger size, as you will see from table for equalizing pipes on page 138 of third edition of "Compend of Mechanical Refrigeration." On the other hand, we do not think that you will cure the back freezing by causing the ammonia to enter at the top and placing the suction at the bottom of the coil. A 6×8-inch Frick, single-acting compressor, operating ninety-two revolutions per minute, would perform a duty of about 1,734 tons ice making capacity each twenty-four hours, and such a compressor would readily draw the ammonia gas through 1,056 feet of 1¼-inch pipe in a sufficient state of saturation to frost the suction pipe back to the compressor, if the expansion valve were opened wide enough to create the requisite back pressure. The most practical cure for freezing back would be to locate a "forecooler tank" between the freezing tank and the compressor with a coil of sufficient length in the "forecooler tank" to cool the water used in the cans before said water is delivered to the cans. This method would perform a double service, in that it would utilize the excess heat absorbing capacity of the ammonia after leaving the expansion coils in the freezing tank, thereby cooling the water to be frozen, and at the same time it would prevent the frosting back to the compressor—and it is always advisable to avoid frosting back on a single-acting compressor. If you would send us a sketch of the present arrangement of connections to your coils, and also a sketch of the manner in which you propose to change the connections we would be in a better position to advise you intelligently in the premises.

PURITY OF CALCIUM CHLORIDE.

To the Editor: Will you kindly answer in the next issue, the following questions: What is the percentage of purity in commercial calcium chloride, such as is used for brine in refrigeration? Would it not be better to use crystallized calcium chloride even at a considerably enhanced cost? What do the impurities or adulterants consist of? Is there any simple test for determining proportions of impurities, etc.? Is not the crystalline form necessarily the purest? G. M. O.

ANSWER.—We cannot say what the percentage of purity of "commercial chloride of calcium" is, nor what its impurities might be in a given case. However, if you will send us a sample of the material you have in view, we will have it examined and give you the desired information. We do not think that chloride of calcium is purposely adulterated with anything.

Crystallized chloride of calcium is most probably purer than the other, but to what extent, and as to the comparative economies of its use, it is impossible to form an opinion without a comparative chemical examination and without knowing prices.

TO FIGURE CAPACITY OF MACHINE.

To the Editor: We beg leave to ask your opinion as to the extreme capacity of a single-acting compression ice machine, ammonia pumps, 10-inch bore, 15-inch stroke, with Corliss engine attached of 14-inch bore, 15-inch stroke. Would like to know its refrigerating capacity with direct expansion alone, and its capacity of ice making and refrigeration, with direct expansion together, the ice rooms to contain about 11,000 cubic feet, and what should be its ice making capacity on a forty-eight-hour system, using a brine agitator engine. E. C. I.

ANSWER.—You omit one of the most important factors on which to base a calculation of the capacity of the machine, viz., you do not specify the speed at which the machine is to be operated; consequently we will have to take what we consider a safe speed for such a machine as a basis of calculation, viz., eighty revolutions per minute. On this basis the following equation would be reliable for the capacity of the machine, provided the machine is in first-class working order and is connected with suitable freezing and condensing surfaces. $\frac{78.54 \times 15 \times 2 \times 80}{12,000} = 15.7$ tons ice making capacity in twenty-four hours. In the above equation 78.54 is the area of a 10-inch pump in square inches; 15 is the length of the stroke in inches; 2 is the number of pumps on the machine; 80 is the number of revolutions per minute; 12,000 is the number of cubic inches displacement per minute per ton of ice making capacity each twenty-four hours.

Figuring the capacity of the machine on a refrigerating basis, the equation would be as follows, viz.: $\frac{78.54 \times 15 \times 2 \times 80}{7,000} = 26.57$ tons refrigerating capacity in twenty-four hours. The factors in this equation are the same as those for the ice making capacity, with the exception that the allowance of displacement per minute is 7,000 cubic inches for refrigerating capacity, while 12,000 cubic inches displacement per minute is allowed for ice making capacity. About taking care of the 11,000 cubic feet of ice storage rooms, would say that the capacity required for this work would depend entirely upon the character of the insulation of said rooms and the care and attention that are exercised in keeping the doors of the ice rooms closed. With first-class insulation, ample piping for cooling surfaces and automatically closing doors on the ice skid openings to the rooms the refrigeration of the rooms should not take off more than one ton from the ice making capacity of the plant each twenty-four hours. We should prefer to refrigerate the ice rooms with brine circulation from the freezing tank rather than to have a separate direct expansion connection for the refrigeration. With both refrigeration and ice making working on the same compressors you will have a variation of back pressure from the two sources, consequently there will be quite a nicety of adjustment of expansion valves required to maintain a regularity of circulation, without which there would result a backing up of the higher pressure gas from one system to the lower pressure gas in the other system, which would cause a very irregular and unsatisfactory condition of operation. You will lose no more in ice making capacity by circulating the brine from the freezing tank for the refrigeration than you would by operating the refrigeration by direct expansion, and you can control the pressures much more readily.

ICE PER TON OF COAL.

To the Editor: There seems to be a great difference of opinions in regard to the amount of coal consumed in the manufacture of ice. We would like you to give us your idea on this subject from your observations, and what size plant would be the most economical as per fuel account. P. I. C.

ANSWER.—The great difference of opinion as to the amount of coal required for ice making is explained by the varying conditions (kind of coal, kind of boiler, kind of engine, qualifications of firemen, etc.). With good Corliss engine and other first-class appointment, a ton of ordinary Illinois coal should make about five tons of ice, while a ton of Pocahontas coal should make about eight tons of ice—that is by the can system when the exhaust steam is used for making the distilled water for the ice. In the plate system, making ice from ordinary water, in which case a compound condensing engine can be used, one ton of Illinois coal would make about seven tons of ice, and one ton of Pocahontas coal about nine to ten tons of ice. The larger the size of a plant the less coal will it take per ton of ice, other circumstances being equal.

ICY ITEMS.

——The Ferd. Heim Brewing Co., of Kansas City, Mo., are in the market for ice cans.

——The Talladega (Ala.) Ice Co., P. B. Brown, proprietor, is having its plant completely overhauled and put in first-class condition.

——The Columbus (Ohio) Ice Co. has had plans prepared for a new storage building, to be erected contiguous to their present buildings.

——The Crystal Ice Co., incorporated with a capital of $50,000, is the name of the new organization that succeeds the Crystal Ice and Cold Storage Co., at Davenport, Iowa.

——The Nevada Pure Ice Co., Nevada, Mo., is erecting a building 40×45 feet in size, to be used for ice storage purposes. Room for about 500 tons of ice will be provided.

——The plant of the Gadsden ice factory, Gadsden, Ala., it is reported, has been purchased by the owners of the Dwight cotton mills, and is to be removed to Alabama City, and operated there.

——The postmaster at Buffalo, N. Y., is endeavoring to pursuade the postal authorities at Washington to order the installation of a refrigerating plant in the new federal building now being erected at Buffalo. Sanitary as well as economic advantages were urged. The time is doubtless not far away when all our large public buildings will be thus equipped.

——A company under the title of "La Internacional Compania Exportadora S. A.," has been formed at Chihuahua, Mexico, with a capital of $1,000,000, which will build and conduct a large slaughtering and packing house and canning factory here, and similar establishments at two other points in the republic. The concession received by the company covers the packing and canning of sardines and other varieties of fish, and the slaughtering of beef, swine and sheep. The company includes among its directors Banker Enrique C. Creel, of Chihuahua; Juan Terrazas, J. Francisco Molinar, Juan F. Brittingham and Federico Sisniega—names that insure the stability of the proposed concern—and interested with the local firm in the enterprise is the well known firm of packers of Morris & Butt, of Kansas City and the City of Mexico. As soon as the building, for which a site has already been selected, is fairly under way, Mr. A. J. Morris, of the firm of Morris & Butt, will go to the States to purchase the necessary machinery for its operation.

EXPORTS OF ICE.

THE exports of ice during the month of January, 1900, amounted to 487 tons, valued at $1,414, as against 1,294 tons, valued at $2,088, for the same period of 1899. For the seven months ending January 31, 1900, the total exports of ice amounted to 8,500 tons, valued at $18,538, as against 16,362 tons, valued at $30,383, for a like period in 1899. The establishment of ice factories in Mexico and the West Indies will tend to further diminish the export trade in ice from this country.

THE harvest season has not proved as satisfactory as that of 1899, and much more anxiety was felt by the dealers over the uncertain conditions. Much thin ice has been harvested. The west, generally, has an abundant crop, while in the east the crop is somewhat irregular, some points having plenty and others but a scant supply, or none. Altogether, however, an average ice crop was made, and the quality of the ice was of the best.

THE reports issued by Willis L. Moore, chief of the United States weather bureau, show that during February snow covered all the northern portions of the United States except the Pacific coast, and as far south as Mason and Dixon's line. On the 20th the depth of snow was about eight to twelve inches in New England, a few Maine points showing twenty inches; two to five inches throughout the eastern and central states; one or two inches, or traces merely, in the western and southwestern states. Michigan had nearly as much snow as Maine, while Minnesota had but three or four inches. Kentucky and Illinois both were covered with two or three inches of snow, but none fell south of Kentucky. The thickness of ice in rivers and harbors varied greatly, being fifteen to twenty-seven inches in the Missouri river, north of Omaha, only two inches at Albany, N. Y., and eleven inches at Buffalo, N. Y. Notwithstanding the general increase in ice formation during the month, there was still decidedly less ice throughout the northern portions of the country than at the corresponding date of 1899, when there was generally from four to nine inches more in the upper Missouri, from two to ten inches more in the upper Mississippi, and generally from two to eight inches more in the lake region and New England.

HARVESTING NOTES.

MAINE.

PORTLAND.—Before the warm spell considerable 13 or 14-inch ice of excellent quality was housed along the Kennebec, the amount being variously estimated at from one-third to one-half an average crop. Two new ice houses have been erected, increasing the capacity by about 100,000 tons. It is expected that the cut will reach about 700,000 tons. Between [illegible] and [illegible] tons remaining of last year's crop are in the houses, so that the total amount to be housed will approximate 1,000,000 tons. It is [illegible] further stated that in view of the [illegible] up the Hudson river region, considerably more ice will be put up here.

BANGOR.—Along the Penobscot many houses were filled before the warm [illegible] 14th to 16th [illegible] 17th, [illegible] most of the [illegible] waiting for their [illegible]. At this time last year [illegible] and stacks were being made [illegible]. It is estimated that not over 200,000 tons will be harvested this year. In 1899 nearly [illegible] tons were housed [illegible] the Penobscot. Heavy snow interfered to some [illegible] the expense of harvesting, but the ice gathered [illegible] quality.

NEW ENGLAND.

[illegible], N. H.—The Fresh Pond Ice Co. reports having housed [illegible] tons of 12-inch ice, which is better than [illegible]

FALL RIVER, MASS.—[illegible], the large houses were [illegible]

NORTH ADAMS, MASS.—The total crop housed at this point on February 10 aggregated about 15,000 tons, which is 3,000 tons more than the crop of 1899. The ice averages about seventeen inches in thickness, and is of excellent quality.

BOSTON, MASS.—Reports from points throughout New England indicate that much anxiety exists among the dealers over the uncertainty of the crop. February 10 there were still so many empty houses that fear was expressed that even with favorable conditions later on a sufficient crop could hardly be expected. True, in some quarters houses were filled, and the situation was favorable, but these would not balance the many places where the contrary was true. The cold spell during the last few days of the month revived hopes, and it is yet possible that satisfactory crops may be obtained.

NEW YORK.

NEW YORK CITY.—Reports from various points in the state indicate that the situation is unfavorable except in the northern portions of the state. Up in the Catskill and Nyack regions plenty of good ice has been housed, but at Albany and the Hudson valley very little harvesting has been done. There is considerable ice held over from last year in the houses along the Hudson, the total amount being estimated as high as 1,000,000 tons, but unless during the last of February or in March harvesting conditions greatly improve there will be a serious shortage in the supply for 1900.

ILLINOIS.

CHICAGO.—A full crop of excellent ice, harvested under favorable conditions, is assured. The large ice houses at W[illegible] lake are all filled, while the crop in southern Wisconsin is equally fine and plentiful. The amount harvested in the territory directly tributary to Chicago is estimated at from 2,[illegible] to 2,500,000 tons.

MOLINE.—The record has been broken for ice harvesting at this point. Over 60,000 tons of ice is now in the ice houses here.

IOWA.

DUBUQUE.—A plentiful harvest of ice has been gathered, over 60,000 tons being stored in the houses here.

DES MOINES.—The capacity of all the houses has been taxed to store the fine crop of ice harvested. At least [illegible] tons are stored here for local use.

CLINTON.—Over 40,000 tons of clear ice, twelve to sixteen inches in thickness, have been stored in the ice houses here.

NEBRASKA.

OMAHA.—Reports from various points in the state indicate that a full crop of A 1 ice has been housed. The ice ranges from nine to sixteen inches in thickness. The several packing house concerns here have housed, it is stated, about 7[illegible] tons of ice.

MINNESOTA.

MINNEAPOLIS.—Ice harvesting in the northwest has been as usual plentiful, and little difficulty was experienced in housing it. The houses in this city have about 300,000 tons stored, and those at St. Paul about the same amount.

WISCONSIN.

MILWAUKEE.—The Wisconsin Lakes Ice and Cartage Co. have virtual control of the ice business here. Their houses have a total storage capacity of 280,000 tons, and are nearly all filled to their capacity.

NATURAL ICE NOTES.

——The Peerless Ice Co., Oswego, N. Y., has purchased the ice business of Emory F. Smith.

—The Channel Ice Co., Moline, Ill., is building an ice house of 1,200 tons capacity.

—J. D. Phelan and A. R. Jones have formed a partnership at Menominee, Mich., to engage in the ice business.

—A company is being organized at Dunkirk, N. Y., to engage in the ice business. C. L. Melvin is the promoter.

—A company is being organized by parties from Syracuse, N. Y., who propose to harvest ice from Oneida Lake and ship it to Albany.

—J. A. and R. W. Collins, of Goshen, Ind., have purchased the ice business, ice houses and privileges of C. A. Irwin, of that city.

—The Saco & Biddeford Ice Co., of Saco, Me., has leased its plant to F. Pelletier & Co., of Biddeford, who also [illegible] control of all the business of the Saco company.

—J. B. Young, Wm. Ewald and J. Casebeer have formed a partnership at Waterloo, Iowa, for the purpose of [illegible] for the coming season. A building 30[illegible] feet, sixteen feet high will be erected.

—The directors of the Consolidated Ice Co., of New York, at their meeting, February 16, decided to at once rebuild the ice houses burned at Farmingdale, Me., a year ago. These houses had a capacity of 200,000 tons, and [illegible]

—The Kerber Lake Ice Co., Sandusky, Ohio, [illegible] chased the Waterfield ice house, together with [illegible] tons of ice. The Kerber company has been reorganized [illegible] capital increased from $[illegible] to $[illegible]. The officers are Frank A. Kerber, president; John Kerber, vice-president; John Kerber, treasurer; Ed. Kerber, secretary and manager.

PACKING HOUSE PRODUCTS FOR SO. AFRICA.

ACCORDING to recent reports from United States Consul General Stowe at Cape Town, South Africa, a good opportunity is presented at the present time for the exportation of frozen meat and slaughter stock to Cape Colony and Natal. The scarcity and high price of meats has induced the government of these two states to suspend the 4-cent duty on imported frozen meat, although, unfortunately, that on canned meats was allowed to remain. "The act that provided for the suspension of the duty," says Mr. Stowe, "also provided for the issue of loans for cold storage plants to be built by any one. The suspension of duty has a limitation, but the cold provision will continue. The trade in chilled meats is in the hands of a monopoly. I wish to call the attention of our cattle and sheep raisers to the fact that while the United States has no refrigerator ships, plenty of ships can be chartered to bring good slaughter stock here. Horses and mules, which come in large numbers, reach this port in excellent condition without loss of weight, and it is to be presumed that the same would be true of slaughter cattle." The war will practically exhaust the natural meat resources of the country, and for some time to come the country will have to depend upon foreign markets for its meat supply. It is reported that extensive orders for canned meats have recently been placed in the United States by representatives of the South African republics, while the war office of the British government recently purchased 280 head of cattle in Ohio for shipment to Durban, in Natal, besides large quantities of canned meats for use of the British armies.

PACKING HOUSE NOTES.

——A project is under way at Bay City, Mich., to organize a company with a capital of $100,000, for the purpose of building and operating a packing house plant.

It is reported that the Hammond Packing Co., of Omaha, Neb., contemplate the building of a branch packing house plant at Kansas City, or of removing their Omaha plant to Kansas City.

The A. C. Cooper Packing Co., Rochelle, Ill., has put in recently, it is stated, a 15-ton refrigerating plant. The company will also engage in slaughtering, and expect to kill about fifty hogs daily.

The city council of La Crosse, Wis., has given a permit to Messrs. [illegible] & [illegible] to erect and operate a packing house to cost $[illegible] and have a capacity of slaughtering and packing 300 hogs daily.

The W[illegible] Packing Co., Topeka, Kan., has commenced the construction of a new building, [illegible] feet in size, five [illegible] to cost about $[illegible] and to be equipped and used as a [illegible] house and cold storage plant.

——The Kensington Beef and Provision Co., Kensington, O[illegible], has been incorporated to engage in the business of slaughtering and [illegible]. The incorporators are J. W. Cox, C. A. S[illegible], J. W. Davis and J. G. Wright. Capital, $[illegible].

The [illegible] Packing Co., of La J[illegible], has been incorporated to do a slaughtering business. Capital, $[illegible]. Incorporators are O. M. S[illegible], H. E. M[illegible], P. Sprigg, [illegible], J. H. K[illegible] and H. E. K[illegible] of [illegible].

The [illegible] packing and provision [illegible] of Peoria, Ill., has been [illegible] the [illegible] of the Peoria Packing Co., with a capital of $[illegible]. The officers are President, John W[illegible], vice-president, Fred L. W[illegible], secretary and treasurer, William C. [illegible].

——The P. T. George Co., Baltimore, Md., was incorporated last month by W. M. Oler, J. W. Hall, J. D. Ferguson, W. F. Jackson, J. P. Winchester and P. T. George who are also the directors of the company for the first year, to succeed to the packing house business of P. T. George & Sons. The capital stock is $170,000.

——The new plant of the Hammond Packing Co. at St. Joseph, Mo., was completed and started in operation last month. Construction on the nine buildings comprising the plant was begun in April, 1899. The buildings cover about three acres of space. The plant will have a capacity, it is stated, of 2,500 hogs, 2,000 cattle and 3,000 sheep daily, when run to the limit. The plant is equipped throughout with the latest and best machinery, including two 250-ton refrigerating machines with ammonia condensers and ice tank of fifty tons ice making capacity, which were supplied by the Ice and Cold Machine Co., of St. Louis, Mo.

FRIGIFEROUS PARTICULARS.

——It is reported that arrangements are being made at Boise City, Idaho, to build an ice making plant. Estimates have been asked for.

——S. Albert Laning and Joseph Woodruff, of Bridgeton, N. J., have purchased Frank Smith's ice plant at Wildwood, N. J., and will operate it.

——J. A. Woodard's Crystal Ice and Cold Storage plant is being equipped with direct expansion pipe system, supplied by the Frick Co., of Waynesboro, Pa.

——The ice making plant of the Brenham (Tex.) Compress, Oil and Manufacturing Co. is being overhauled and completely repaired and improved.

——The La Crosse Butter and Cheese Co. has purchased the cold storage plant of the La Crosse Packing and Provision Co. at La Crosse, Wis., and will operate the same.

——M. Seitz's Son, brewer, 256 Maujer street, Brooklyn, N. Y., is having the double-acting compressors on the refrigerating machine in his brewery removed and replaced with single-acting compressors, by the York Manufacturing Co., of York, Pa.

——The Lahman-Keiser Co. has been organized at Stillwater, Okl. Ter., with a capital of $15,000, to build and operate an ice making plant. Frank C. Lahman, of Franklin Grove, Ill., is president, and C. E. Lahman, of Stillwater, secretary.

——The Burt Manufacturing Co., of Akron, Ohio, have just completed a shipment of the Cross oil filter, manufactured by them, for the Paris Exposition. These goods are finished especially for their own exhibit, and for use in the power house of the United States machinery exhibit there.

The York Manufacturidg Co., of York, Pa., builders of ice and refrigerating machines, have recently added to their facilities by the erection of a complete malleable iron foundry and fitting shop, equipped with air furnace, three annealing ovens, molding machines, sand blast apparatus, etc.

——The Crystal Ice Co., of Florence, Colo., have shipped their old 2-ton machine to Canon City, where it will be used by Morgan & Wright, butchers, for cold storage. The 5-ton machine used at Canon City will be shipped to Florence, which, in addition to the machine already in place, will give the plant a capacity of fifteen tons daily.

——An ice plow, with blades twenty-two inches in depth and a length of six feet, was recently ordered from Bergen, Norway, by cablegram, to be shipped within one week. That a tool of this very unusual size was shipped within five days after receipt of order, by Wm. T. Wood & Co., of Arlington, Mass., is a splendid testimonial to Yankee enterprise and ingenuity.

——The Liquefied Air Cremation and Consuming Co., capital, $10,000,000, and the Sea Power Co., capital, $1,000,000, have been incorporated recently in South Dakota by Stephen H. Emmens, of New York, and his associates, who assert that they have perfected a process for manufacturing liquid air by utilizing the natural force of the surf that beats upon the coast. Marvelous advantages are to result, not the least of which, perchance, will be the ability to sell stock in the two corporations named to credulous investors.

FIRE AND ACCIDENT RECORD.

Ferdinand Wieber's cold storage building, at Houghton, Mich., was partially destroyed by fire February 19. The damage was estimated to be about $1,000.

—Four ice houses at Harvey's lake, the property of Barnum & Wright, of Wilkesbarre, Pa., were destroyed by fire February 14, loss, about $10,000. The houses were empty.

The storage house of the Consumers' Ice Co., Wilmington, Del., was burned recently, causing a loss of over $[illegible]. Boys playing with matches is given as the probable cause.

G[illegible] & Co.'s cold storage warehouse, at [illegible], Ohio, was destroyed by fire January 2[illegible], supposed to have started from a defective flue. Loss on building, $[illegible]; on contents, part of which were saved, $[illegible].

THE following memoranda of projected ice factories and refrigerating plants, or of those in course of construction, and of improvements and betterments in existing plants, have come to our notice during the past month:

ALABAMA.

Gadsden.—The Gadsden Coal, Light and Ice Co. are in the market for pumps for their ice factory.

ARIZONA.

Nogales. The Nogales Electric Light, Ice and Water Co. is building a brick addition for cold storage purposes, and will otherwise improve its plant.

Safford. The Safford Ice and Electric Co. has let contracts for the erection of an ice making and electric lighting plant. Geo. A. Olney and Z. C. Prince are the proprietors.

CALIFORNIA.

Hanford. Geo. C. Aydelott expects to erect an ice making plant here in the near future. A company is being organized, and cold storage facilities may be added.

CANADA.

Phoenix, B. C.—Vaughan & McInnes have commenced the erection of a modern cold storage warehouse 30×70 feet in size, two stories high.

Toronto.—The Artesian Ice Co. has been chartered to manufacture and sell ice, provide cold storage, etc. Capital stock, $1,000,000. First directors: J. R. Barber, S. F. McKinnon, John Flett, G. S. Ryerson and J. J. Long.

COLORADO.

Denver.—The Capital Ice Co. is preparing to make extensive improvements in its plant, and has already contracted with the Fred W. Wolf Co., of Chicago, for a 185-ton Linde refrigerating plant and a 40-ton ice making plant, complete.

CONNECTICUT.

Bridgeport. The Naugatuck Valley Ice Co. is contemplating the erection of an ice making and cold storage plant. Estimates are being secured.

Norwich. A new company, to be known as the Norwich Hygeia Ice Co., has been organized and is preparing to erect a plant for the manufacture of ice. Substantial buildings will be erected. The equipment includes two 125-horse power boilers and a 60-ton De La Vergne ice machine.

FLORIDA.

Bradentown. The Lyle Ice Manufacturing Co. has been organized for the purpose of erecting and operating an ice making plant and to prepare fertilizer from fish waste. A 10-ton ice machine will be put in.

GEORGIA.

Dublin. J. E. Smith, of the Dublin oil mill and ice factory, has let contracts for the construction of a building to house a new ice making plant. A 10-ton ice machine, it is said, is to be put in, for which bids are now being taken.

Gainesville. The Express Refrigerator Car Co. will put in a 25-ton ice making plant. Contract for the machinery has already been awarded.

HAWAII.

Honolulu. The Hawaiian Electric Co., Limited, requests tenders on one 7[illegible] [illegible] condensing engine compressor, with condenser [illegible] for one 10-ton ice tank, also, for a [illegible] and [illegible] plant.

ILLINOIS.

Chicago. Andrew V. Markey contemplates the equipment of his hotel at 2[illegible] W. Monroe street, with a refrigerating machine.

Chicago. The fish and oyster house of A. Booth & Co., as [illegible] will erect a cold storage warehouse on K[illegible] street, between Wells and La Salle. The lot [illegible] feet. A building [illegible] stories in height, [illegible]. Among the equipment will be three [illegible] power boilers, and about [illegible] tons of refrigeration. Total cost, estimated, $[illegible].

Chicago. The Merchants' Loan and Trust Co., of Chicago, will have an electrically driven [illegible] plant for [illegible] the water, installed by Westinghouse, Church, Kerr & Co., of New York.

Chicago. Barrett & Barrett, brewers, are erecting a new plant for brewing ale, and will equip same with a 16-ton refrigerating plant, contract for which has already been made with Kroeschell Bros. Ice Machine Co., of Chicago.

De Kalb. The De Kalb Pure Ice Co. has been organized by Frank Rollins and Plank Bros., and a plant is now being erected for ice making and cold storage purposes. The new buildings will be 36×100 feet in size, with three storage rooms, each 12×31 feet in size. The plant will be equipped with a 15-ton ice machine, supplied by the Healy Ice Machine Co., of Chicago, and is to be ready for operation about May 1, 1900.

Manteno.—Merwin C. Conner talks of putting in, in the near future, a 3-ton ice making plant.

Newton.—A company is being organized here for the purpose of building and operating an ice making and cold storage plant.

New Athens.—The New Athens brewery is about to be improved by the addition of a 25-ton Linde refrigerating machine and brewing plant, to be supplied by the Fred. W. Wolf Co., of Chicago.

Peoria.—Swift & Co., packers, have had plans prepared for a cold storage warehouse, to be erected here at a cost of about $25,000.

Pleasant Valley.—Alex. Smith has decided to equip his creamery with a 2½-ton refrigerating machine, contract for which has been awarded to the Creamery Package Manufacturing Co., of Chicago.

Sidell.—The Sidell Electric Light and Cold Storage Co. has been organized and incorporated with $12,000 capital, to build an ice making, cold storage and electric lighting plant.

Tuscola.—A company is being organized to build an ice making plant here this spring.

IOWA.

Britt.—The Britt Creamery Co. is preparing to equip its creamery with a 4-ton refrigerating machine, to be supplied by the A. H. Barber Manufacturing Co., of Chicago.

Davenport. The troubles of the Davenport Crystal Ice and Cold Storage Co. have culminated in a reorganization and the formation of a new corporation, to be known as the Crystal Ice Co. The sum of $12,000 has been subscribed by the stockholders, to be used in repairing and enlarging the plant. New machinery to increase the capacity from twenty-five to fifty tons per day is to be added. S. F. Smith, H. T. Denison, E. Wilckens, H. O. Seifert, J. F. Bredow, C. Niemand and H. H. Vogt are the new directors.

KANSAS.

Empire City.—An ice making plant, to cost $50,000, is to be erected at this place by Messrs. Butt & Morris, of Kansas City.

Fort Scott.—A firm in this city is contemplating the erection of an ice plant in the near future.

Junction City.—Messrs. Fogelstrom, Swenson & Nelson contemplate erecting an ice making plant of about fifteen tons capacity.

Marysville.—An ice factory is projected here. Frank Hutchinson can give particulars.

Pleasanton. A. M. Kent is at the head of an enterprise proposing to erect and operate an ice making and electric lighting plant here. Mr. Kent informs us that the plant will not be built now.

Smith Centre.—Peck & Burr, ice dealers, are taking figures on the construction of a proposed 15-ton ice factory.

Solomon. Butcher Bros. have acquired possession of the old water mill near the Santa Fe railroad tracks, and will convert same into a modern cold storage warehouse. It is the intention later to add an ice making plant.

Topeka. The Moeser Ice and Cold Storage Co. is preparing to improve its plant by the addition of a new building to cost about $10,000, and to be equipped with new engine, boiler, etc.

Topeka. The Wolff Packing Co. is putting up a new building, 90×150 feet in size, to be used for slaughtering and equipped for cold storage purposes, at a cost of over $[illegible].

KENTUCKY.

Bowling Green. Henry D. Fitch, manager of the Bowling Green Railway Co., has decided to put in a 30-ton ice making plant, and seeks estimates on machinery, etc.

Henderson.—Herman Vogel has decided, it is said, to erect an ice making and cold storage plant, and preparations for its construction are now under way.

Louisville. The Seelbach hotel is being equipped by an [illegible]-ton refrigerating machine, supplied by the De La Vergne Refrigerating Machine Co., of New York.

LOUISIANA.

Boyce.—It is reported that the City Ice and Water Co., [illegible] J. E. B[illegible], is in the market for ice making and water works machinery.

Breaux Bridge. A new ice making plant is to be erected here, the city council having donated a site for same.

SOUTH DAKOTA.

Sioux Falls. The Sioux Falls Brewing and Malting Co. are equipping their plant with a new 50-ton refrigerating machine, supplied by the Fred W. Wolf Co., of Chicago.

TENNESSEE.

Johnson City.—Stevens Bros. have secured a site on which to erect an ice making and cold storage plant.

Mt. Pleasant. D. H. Rahm & Co., proprietors of the new electric light plant, have decided to add a 50-ton ice making plant, to be ready for operation early next summer.

Nashville. The Wm. Gerst Brewing Co. is increasing its facilities by the addition of a 20-ton ice making plant, complete, supplied by the De La Vergne Refrigerating Machine Co., of New York.

Sweetwater.—D. L. Smith and others have organized a company which proposes to build and operate an ice making plant and cannery.

Tullahoma. D. R. Tope and L. E. Fox, of the Tullahoma Electric Light and Ice Co., have decided to improve their plant by the addition of a 10-ton ice machine.

Memphis. Oliver, Finney Grocery Co., conducting a wholesale grocery and chocolate factory, have decided to secure cool temperatures by means of a 7-ton refrigerating machine, contract for which has been awarded to the A. H. Barber Manufacturing Co., of Chicago.

TEXAS.

Fort Worth. J. V. Goode will engage in the manufacture of ice, and has contracted with the Fred W. Wolf Co., of Chicago, for a 40-ton Linde ice machine and plant complete.

Gatesville.—It is stated that a 20-ton ice making and refrigerating plant will be installed at the house of correction here, the governor having approved the request for same by the superintendent.

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WEST VIRGINIA.

Charleston. [illegible] Charleston, [illegible] ICE AND REFRIGERATION.

WISCONSIN.

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SOUTH DAKOTA.

Sioux Falls The Sioux Falls Brewing and Malting Co. are equipping their plant with a new 50-ton refrigerating machine, supplied by the Fred W. Wolf Co., of Chicago.

TENNESSEE.

Johnson City Stevens Bros. have secured a site on which to erect an ice making and cold storage plant.

Mt. Pleasant D. H. Robin & Co., proprietors of the new electric light plant, have decided to add a 50-ton ice making plant, to be ready for operation early next summer.

Nashville. The Wm. Gerst Brewing Co. is increasing its facilities by the addition of a 25-ton ice making plant, complete, supplied by the De La Vergne Refrigerating Machine Co., of New York.

Sweetwater.—D. L. Smith and others have organized a company which proposes to build and operate an ice making plant and cannery.

Tullahoma D. R. Tope and L. E. Fox, of the Tullahoma Electric Light and Ice Co., have decided to improve their plant by the addition of a 10-ton ice machine.

Memphis. Oliver, Finney Grocery Co., conducting a wholesale grocery and chocolate factory, have decided to secure cool temperatures by means of a 7-ton refrigerating machine, contract for which has been awarded to the A. H. Barber Manufacturing Co., of Chicago.

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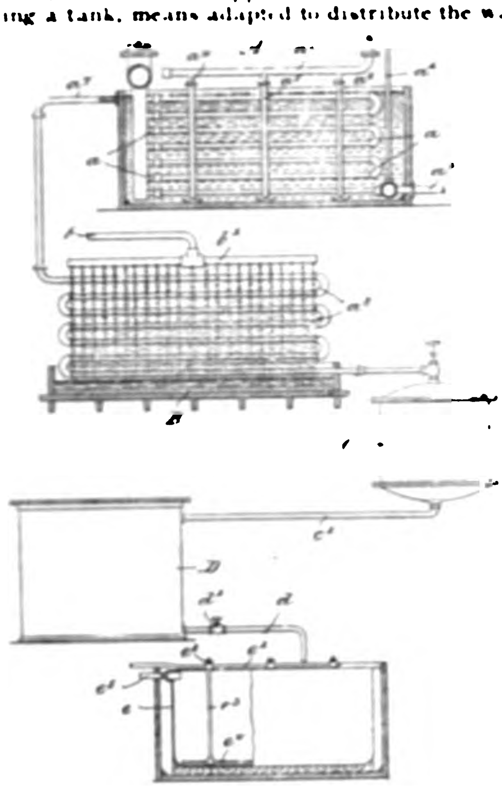
APPARATUS FOR MANUFACTURING ICE.

No. 641,814. Jacob F. Wagner and Arthur Freeston, Philadelphia, Pa., assignors to the Ice Manufacturing Co., of Germantown, same place. Filed October 11, 1899. Serial No. 733,266. Patented January 23, 1900. No model.

Claim.—1. An apparatus for manufacturing ice, comprising a tank, means adapted to distribute the water in a certain portion of said tank, means for conducting a heating media through the water in said tank in a direction opposite to the distribution and movement in volume of the water in said tank, means for permitting of the discharge of the water in its hottest condition in volume in said tank from the same, said tank connected with a cooling coiled tank by means of a pipe connection from said coils in said tank and having a perforated water discharge over said coils, a filtering appliance connected with said cooling coil tank and through a reservoir with an ice forming tank having a cell on each side for containing brine or ammonia and an exit from said cell, substantially as and for the purposes described.



METHOD OF MANUFACTURING ICE.

No. 641,742. Jacob F. Wagner and Arthur Freeston, Philadelphia, Pa., assignors to the Ice Manufacturing Co., of Germantown, same place. Filed August 16, 1899. Serial No. 727,346. Patented January 23, 1900. No specimens.

Claim.—The herein described method of making plate or block ice, which consists in introducing water into an open vessel, passing a heating media through the body of water maintained in a substantially quiescent state in said vessel and in a direction opposite to the introduction of the water into said vessel, discharging the water in its hottest condition from said vessel, cooling the water in transit without agitation of the same, liberating impurities from the volume of cooled water without coming into contact with atmospheric air, and then freezing the water maintained in a quiescent state progressively into ice toward a medial plane of the body of such treated water, substantially as and for the purposes described.

ADVERTISING REFRIGERATOR.

No. 641,917. Freeman N. Young and Francis E. Thompson, Arlington, Mass. Filed June 28, 1899. Serial No. 722,171. Patented January 23, 1900. No model.

Claim.—1. An advertising refrigerator consisting of a box or casing in the form of a bottle, the body portion having a door or doors and adapted to contain ice and material to be kept cool, and the neck portion being separable from the body portion and provided with racks for supporting glasses, substantially as described.

2. An advertising refrigerator consisting of a box or casing in the form of a bottle provided with a door or doors in its side, and with a ... for drawing off the ... liquid contents, ... with ... capable of imparting ... taste to any liquid contained in the refrigerator.

TRADE LITERATURE.

[illegible]

having trouble with wet steam, or foaming, caused by ... the exhaust, may find it worth while to send for this catalogue at address given above.

AUTOMATIC ice can fillers are described in the new 1900 catalogue issued by James F. Burns, of 811 to 815 ... avenue, Philadelphia, Pa. Mr. Burns is not voluminous in his circular descriptions, but sums up the matter in a couplet which reads:

He that bloweth his own horn
Getteth his horn blowed;
He that filleth not with Burns fillers
Getteth his cans overflowed.

THE catalogue for 1900, issued by Gifford Bros., of Hudson, N. Y., manufacturers of ice elevating, conveying and lowering machinery, deals very comprehensively with the subject, illustrating the more important appliances, among them the adjustable ice gallery, elevator incline, combined elevating and lowering machine, gig elevators, car loading conveyor, etc. This firm is one of the oldest connected with the ice business in the United States, the business having been founded eighty-three years ago.

BECAUSE of the great increase in the number of articles and of sizes in their stock, made necessary by the increasing demand for their patent fittings, the Tight Joint Co., of New York, have found it necessary to issue a new list, same to appear about March 1, 1900, embracing everything they manufacture right up to date, in the ammonia and steam fitting line. The Tight Joint Co. are so well known to the trade as manufacturers and dealers in ammonia and steam fittings, that we are quite sure this list will be looked for with much interest. The new list may be had upon application at their office, 159 Bank street, New York city.

THE improved Willis planimeter is described in a pamphlet, recently issued by James L. Robertson & Sons, of 204 Fulton street, New York. The usual planimeter has a recording wheel, whose axis is parallel to the tracer bar. The improved Willis acts on a different principle. Here the wheel rolls parallel to the tracer bar, and its steel spindle ... beneath rollers for all perpendicular movements. After tracing a figure the result is read from the scale next to the wheel. The scale is triangular, so that any of the graduated edges can be brought next to the wheel and permit the reading to be taken in the unit best suited to the work in hand. This W... instrument embodies the special features of both the L... cott and old Willis planimeters, and will be appreciated by engineers.

TRADE NOTE.

MESSRS. T. B. WRIGHT & CO., of Philadelphia, the well known manufacturers of granulated and pulverized charcoal for filtering purposes, whose plant at Berlin, N. J., was ... February 4, wish to inform the trade that they are erecting a new mill, to be equipped with all modern and improved machinery, and meanwhile they have erected a temporary ... and are prepared to fill all orders promptly.

WANTED AND FOR SALE ADVERTISEMENTS.


STURTEVANT SYSTEM
OF
MECHANICAL DRAFT.

CHAPMAN VALVE MANUFACTURING CO.

MANUFACTURERS OF

VALVES and GATES

For Water, Steam, Gas, Oil, Ammonia, Acid, etc. Also Gate Fire Hydrants.

We give special attention to Valves for Ice and Refrigerating Machinery. We make the best Ammonia Valves in the market. Send for particulars. THE GENUINE CHAPMAN VALVES in all cases will bear our name in full, either rolled in or cut upon the shells, and also our trade mark and monogram.

GENERAL OFFICE AND WORKS: INDIAN ORCHARD (Springfield), MASS
TREASURER'S OFFICE: 72 KILBY ST., BOSTON, MASS.
CHICAGO OFFICE AND SALESROOM: 14 N. CANAL ST.
ST. LOUIS OFFICE: L. M. RUMSEY MFG. CO., 810 N. SECOND ST.
NEW YORK OFFICE: 28 PLATT ST.

Hair... Felting

BEST INSULATOR KNOWN.

DURABLE, CLEAN, FIRE-PROOF

MANUFACTURED BY

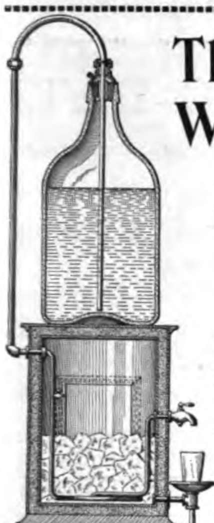
NEW YORK. PHILADELPHIA. **BAEDER, ADAMSON & CO.** BOSTON. CHICAGO.

EUREKA HIGH TEST...

Calcium Chloride

The up to date successful refrigerating people use it for **brine** and for **absorbing** moisture in cold storage rooms. If you are putting in a new plant, **start right!** Buy the best. The price is right. Orders accepted for spot or forward delivery.

EUREKA CALCIUM WORKS, Box 127, Pomeroy, Ohio.



The Siphon Water Cooler

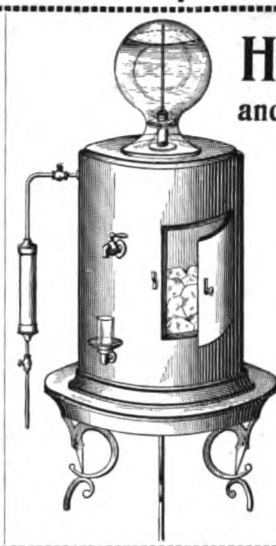
As shown, is fitted with AIR PUMP, which will start SIPHON in a few seconds. It is in every way the

Most Complete Cooler for Offices and Residences

where Spring, Mineral or Distilled Water is delivered in large bottles.

Water is discharged at a lower temperature in the use of half the quantity of ice required in any other cooler.

ABSOLUTELY CLEAN.
SOMETHING ENTIRELY NEW.



Hygienic Filter and Cooler

Patented in the U. S. and Foreign Countries.

The filtered water is drawn through coiled pipe, and cannot come into direct contact with the ice.

Water to be used is always in plain view. Only necessary to open small door to refill cooler with ice.

Better results are obtained by the use of half the quantity of ice required for any other cooler.

Crates and Large Water Bottles
A SPECIALTY.

Hygienic Filter and Cooler Co.

Manufacturers of PURE WATER APPLIANCES,
234 LA SALLE STREET, - - CHICAGO.

LEE-ODLUM BOILER CO.

High-Grade Contract Work
A SPECIALTY

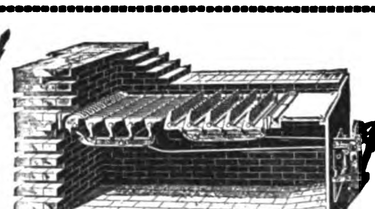
Plate and Sheet Steel Work
OF ALL KINDS.

BOILERS, FREEZING TANKS

Estimates Furnished Promptly after Receipt of Specifications.

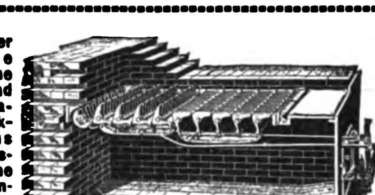
85 to 95 Jefferson Street, MEMPHIS, TENN.

Normal Position of Grate.



Divided Cut-off Movement.

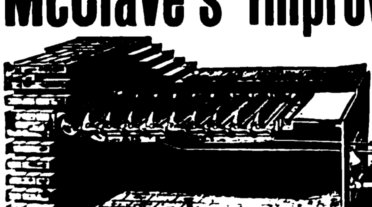
These appliances together combine more valuable features for burning the smaller sizes of hard and soft coal, such as Anthracite, Culm, Birdseye, Buckwheat and Bituminous Slack, than any other system, while the Grate alone stands unequaled for burning the larger sizes of these fuels with natural draught.



Divided Cut-off Movement.

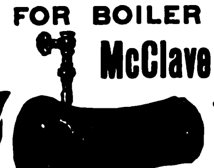
McClave's Improved Grate and Improved Argand Steam Blewer

FOR BOILER AND OTHER FURNACES



Whole Cut-off Movement.

McClave, Brooks & Co. 301-303 7th St., SCRANTON, PA. 1105 Monadnock, CHICAGO.



Argand Steam Blower.

Sectional View.

For full particulars send for Illustrated Descriptive Catalogue D.

Shaking Movement.

(87)

NEW YORK OFFICE, 85 CHAMBERS STREET

HOHMANN & MAURER MFG. CO. ROCHESTER, N.Y. TRADE H&M MARK

41 ELIZABETH STREET

LONDON OFFICE, 106 HATTON GARDEN, E. C.

WRITE FOR CATALOGUE

FIG. A-4

MAKERS OF

Thermometers

FOR ALL

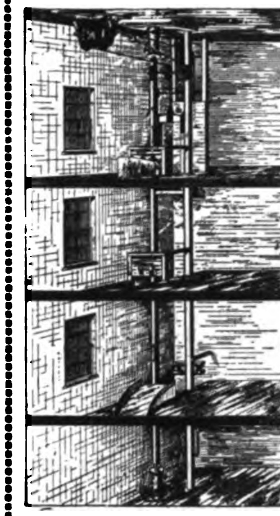
REFRIGERATING
ICE MAKING AND
COLD STORAGE
PURPOSES

THERMOMETER FOR
BRINE TANKS, PUMPS
AMMONIA PIPES
AND STILLS

INSULATED BRINE PIPE
THERMOMETER
FREE FROM FROST

CERTIFIED EGG ROOM
THERMOMETER, ETC.

FIG. 31.



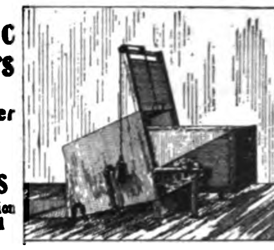
Automatic Conveyors
Without Motive Power

Ice Elevators
of any description for storage, and

Ice Releasing Apparatus

H. MOCK & CO.
Patentees and Mfrs.
171 E. 92d St.
NEW YORK

References Given
Correspondence Solicited



STRICTLY UP-TO-DATE

A PATENT AND IMPROVED METHOD OF PLATE AND BLOCK ICE FREEZING, without artificial circulation or agitation of the freezing water.

The ice is free from air needles, uniform in thickness and quality, and freezes more rapidly, thus increasing the capacity of the plant and avoiding the operation of a pump, air compressor or other steam or power consuming apparatus.

UNAGITATED WATER FREEZING COMPANY
Walnut Lane Station, PHILADELPHIA, PA.

B. P. CLAPP AMMONIA COMPANY,

MANUFACTURERS OF

ABSOLUTELY PURE ∴

LIQUID ANHYDROUS AMMONIA

26° AQUA AMMONIA

CONTAINING 29¼ PER CENT OF AMMONIA.

FOR REFRIGERATING PURPOSES AND THE TRADE

General Offices, 245 Broadway, NEW YORK.

HERF & FRERICHS CHEMICAL CO.

ST. LOUIS, MO.

Manufacturers ...of **Liquid Anhydrous Ammonia**

OUR AMMONIA CAN BE HAD OF THE FOLLOWING:

ATLANTA, GA.—Fred W. Wolf Co.
CHICAGO—Westerlin & Campbell.
F. K. Higbie.
Newberry Warehouse and Storage Co., 79 Kinzie St.
CLEVELAND, OHIO—Cleveland Brewers Supply Co.
DENVER, COLO.—Bridaham-Quereau & Co.
DETROIT, MICH. Farrand, Williams & Clark.
HOUSTON, TEX.—D. M. Garvin, Lone Star Oil Co.
INDIANAPOLIS, IND.—Holt Ice and Cold Storage Co.
KANSAS CITY, MO.—Abner Hood.
LOUISVILLE, KY. Kentucky Malt and Grain Co.
NEW ORLEANS, LA. United Warehouse Co., Ltd.
NEW YORK Herf & Frerichs Chemical Co., 133 William St.
SOUTH OMAHA, NEB—Cuddington & Wilcox, 2415 N St.
ST. PAUL, MINN. C. B. Lyon & Bro.

ABSOLUTELY DRY, PURE AND UNIFORM ALL THE YEAR ROUND.

26° Ammonia

SPECIALLY PURIFIED FOR ABSORPTION MACHINES.

All our Ammonia is made from **SULPHATE AMMONIA** only.
Large capacity, best qualities and quick shipments.

Galvanized Steel ICE CANS

OVER 150,000

OF OUR

Cans in Use and Distributed in 33 States and Foreign Countries,

AS FOLLOWS:

ALABAMA	NEW YORK
ARIZONA	NEBRASKA
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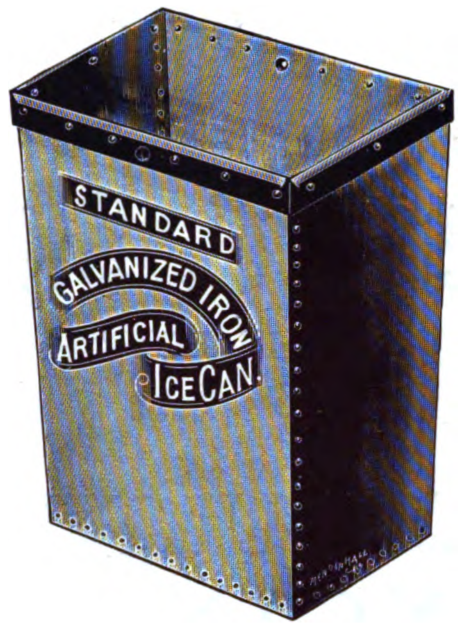
CONNECTICUT	OHIO
DIST. OF COLUMBIA	OKLAHOMA TER.
FLORIDA	PENNSYLVANIA
GEORGIA	SOUTH CAROLINA
ILLINOIS	TENNESSEE
INDIANA	TEXAS
KANSAS	VIRGINIA
KENTUCKY	WEST VIRGINIA
LOUISIANA	WISCONSIN
MARYLAND	SOUTH AMERICA
MISSISSIPPI	BRITISH COLUMBIA
MISSOURI	WEST INDIES
NEW JERSEY	HONOLULU
NEW MEXICO	



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TANKS,
RE-BOILERS,
FILTERS,
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TROUGHS, ETC.

Either of Black Steel or Galvanized Iron,

FOR ICE MAKING AND REFRIGERATING PLANTS.

ESTABLISHED 1881. CAPACITY, 300 PER DAY. INCORPORATED 1890.

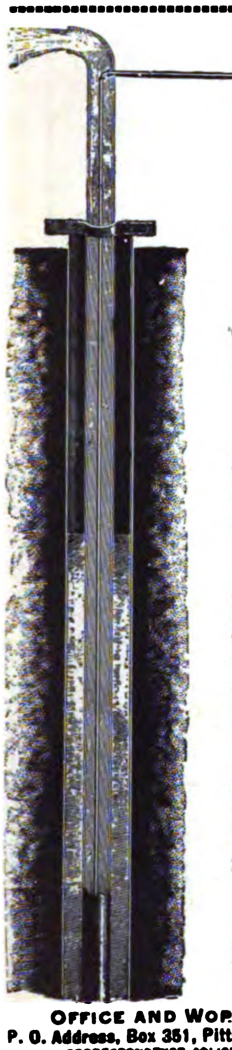
CHRIS. KIECHLER, Sr., President.

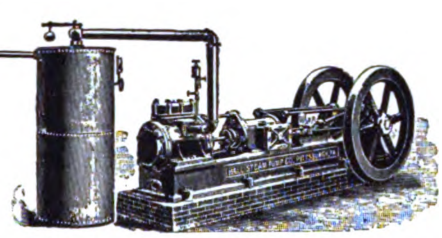
The Kiechler Manufacturing Company

POWER SHEET METAL WORKS

WRITE FOR PRICES

CINCINNATI, OHIO, U. S. A.





THE HALL STEAM PUMP CO.'S

Air Lift Well Pump

BEST SYSTEM FOR PUMPING WATER FROM ARTESIAN OR OTHER WELLS.

Special Advantages: This system dispenses with working barrels, valves, sucker rods and leather cups, which require constant attention and repair.

NO MOVING PARTS used in the well, consequently there is no wear.

A largely **INCREASED** output of water, with a largely **DECREASED** expenditure of power.

No freezing of pipes possible.

OUTPUT FROM ARTESIAN WELLS

Pumped by this system will average from 6-inch wells, 75 to 100 gallons per minute; 8-inch wells, 150 to 500 gallons per minute; 10-inch wells, 300 to 750 gallons per minute, depending only on the productiveness of the well.

Should one well not produce sufficient water, the compressed air from a single compressor may be divided among a number of wells located apart, lifting from each well all the water it can produce

Write for estimate and give the following information:

1—Depth of well. 2—Diameter of well. 3—Depth of water level below the surface when not pumping. 4—Depth of water level below the surface when well is pumped at full capacity. 5—Estimated capacity of well. 6—Elevation above surface to which the water is to be raised.

Plants Erected on a Full Guarantee of Efficient Working.

HALL STEAM PUMP CO.

MANUFACTURERS OF

Steam Pumps, Single or Duplex, and Air Compressors.

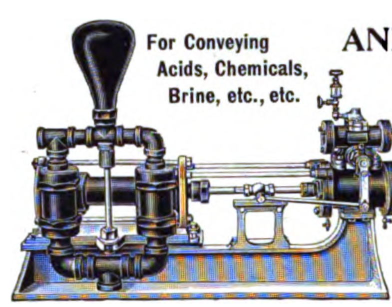
OFFICE AND WORKS, GRANT AVE., NEAR UNION BRIDGE,

P. O. Address, Box 351, Pittsburgh, Pa.

CORRESPONDENCE SOLICITED.

ALLEGHENY, PA.

ACID PUMPS AND FITTINGS



For Conveying Acids, Chemicals, Brine, etc., etc.

Made of

HARD RUBBER

American Hard Rubber Co., New York.

A. D. COOK

MANUFACTURER OF IMPROVED . . .

Tube Well Supplies

COOK'S PATENT

TUBE WELL STRAINERS AND STEAM PUMPS . .

A SPECIALTY.

LAWRENCEBURG, IND.

IRON
COPPER
BRASS

COILS

Bends and
Manifolds

FOR
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PURPOSES

Wrought Iron Ammonia Cocks

Ammonia Valves and

Fittings

Harrisburg Pipe

STILLS and
ABSORBERS

FOR ABSORPTION AMMONIA
ICE AND REFRIGERATING MACHINES

SPECIAL ATTENTION GIVEN TO REPAIRS FOR
EXISTING ICE MACHINES

BENDS

rought Iron

COILS

STARR ENGINEERING CO.

JOHN E. STARR, PRESIDENT.

Consulting and Supervising Engineers and Architects

Complete Cold Storage Installations.
Street Pipe Line Refrigeration.
Ice Plants.

Specialists in Refrigeration and Pure Water Apparatus.

525 WEST STREET, NEW YORK, N. Y

JOHN D. ALLEN COMPANY

900 CHESTNUT STREET
PHILADELPHIA

Architects . and . Engineers

FOR

COLD STORAGES, ICE PLANTS
SKATING RINKS, HOTELS, CLUB HOUSES
APARTMENT HOUSES, ETC.

Contracts taken for Designing and Erecting, including Superintendence

G. A. WEGNER, M. E.

Consulting and Contracting Engineer

For ICE MAKING and REFRIGERATING MACHINERY and PIPING.

AMMONIA PIPES, VALVES AND FITTINGS.

Old Plants overhauled and remodeled. All sorts of Repairing promptly attended to. Expert advice on new installations, or wherever a plant falls short of its usual capacity. Fifteen years' practical experience in the line of Ice Making and Refrigeration enables me to guarantee satisfaction in every instance. Your correspondence is respectfully solicited.

Corner Perry and Washington Sts., BUFFALO, N. Y.

"SCIENCE BIDS DAMPNESS DEFIANCE"

(TRADE MARK)

R. I. W.

Damp Resisting PAINT

(TRADE MARK)

The best Insulation in Cold Storage Rooms. The best Preventive against Rust and Decay on Iron or Wood. No moisture or heat will penetrate through walls coated with R. I. W.

R. I. W. DAMP RESISTING PAINT CO.
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ESTABLISHED 1848. 468-470-472 West Broadway, New York, U. S. A.

WARWICK MACHINE CO.

MANUFACTURERS OF

Ice & Refrigerating Machinery

Of a new and improved pattern; from ½ ton to 15 tons capacity ice making.
We can furnish references from parties who have had our machines in successful operation for ten years.
Write for estimates and prices to our home office.

THE WARWICK MACHINE CO., Newport News, Va.

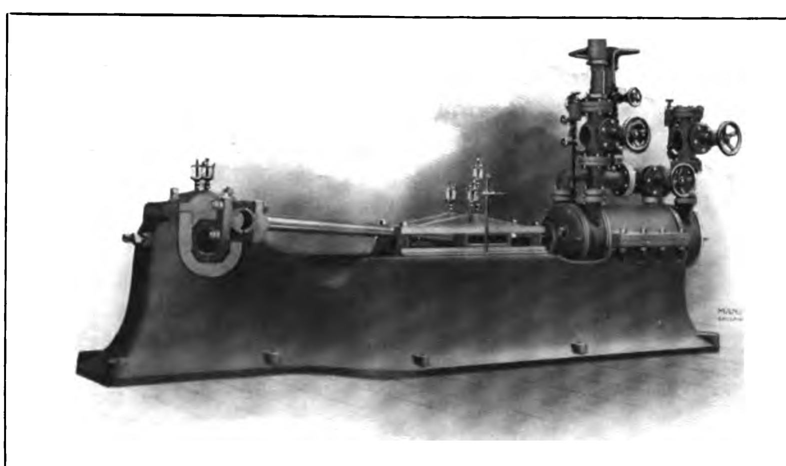
THE BARBER COMPRESSOR

Refrigerating and Ice Making Machinery

Built in 20 different sizes, from 2½ to 50 tons. The first machine built in 1894.

OVER 500

in successful operation January 1, 1900.



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COILS

OF ALL KINDS,

Ammonia Valves and Fittings.

CATALOGUE SENT ON APPLICATION.

TEXAS BRANCH,
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NEW YORK OFFICE,
Townsend Building,
Broadway and 25th Sts.

BUILT BY

A. H. BARBER MFG. CO.

229 South Water St.
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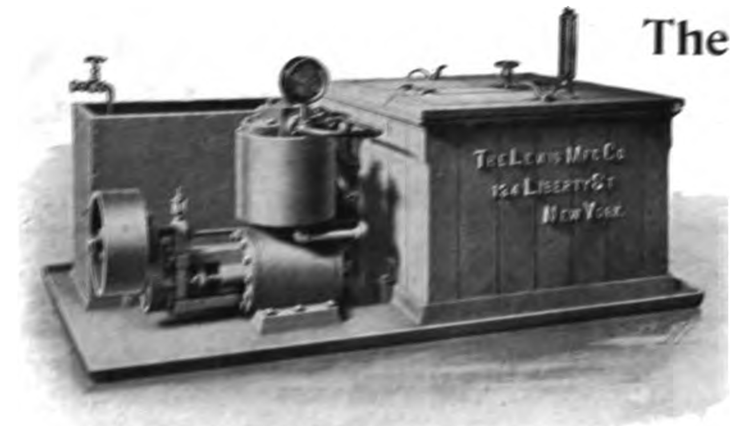


The Portable Ice Machine

Makes 500 to 600 pounds of Ice in 24 hours with $1\frac{1}{2}$ horse power. Requires no engineer. Is shipped all set up, ready to operate, except power.

For Catalogue, address... Price, $450.00.

THE LEWIS MFG. CO.

Sole Proprietors and Manufacturers,

26 Cortlandt St., New York, U. S. A.

The Automatic Refrigerating Machine

NOTHING EQUALS IT IN

EFFICIENCY, SIMPLICITY AND COMPACTNESS, OR EASE OF REGULATION.

ESPECIALLY ADAPTED FOR USE IN

HOTELS, MEAT MARKETS, GROCERY STORES, CONFECTIONERIES, RESIDENCES, Etc., Etc.

Made in sizes from 200 pounds to 5 tons refrigerating capacity.

Send for catalogue, and submit your requirements for estimates.

The Automatic Refrigerator Co.

972 Hamilton St., CLEVELAND, OHIO.

DO YOU WANT?

COLDER BRINE

SAVE COAL

INCREASED CAPACITY

ALSO

AVOID

FREEZING BACK AND LEAKY EXPANSION COILS.

THEN BUY A HENDRICK

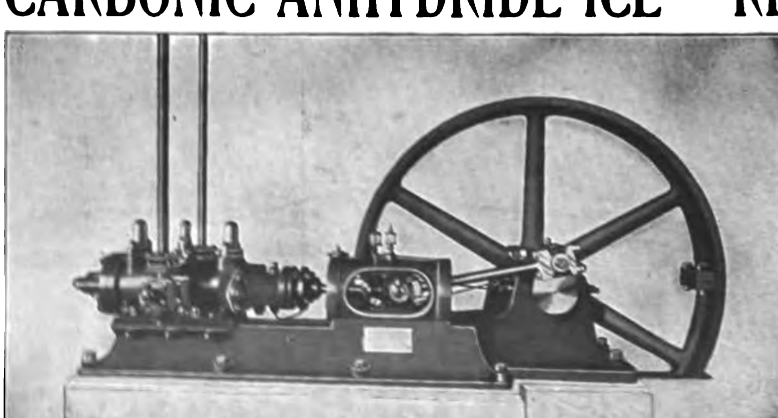
BRINE COOLER : AMMONIA CONDENSER

CARBONDALE MACHINE CO.

MAIN OFFICE AND WORKS, - CARBONDALE, PA.

NEW YORK OFFICE, - 1012 HAVEMEYER BLDG.

CARBONIC ANHYDRIDE ICE AND REFRIGERATING MACHINE



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MANUFACTURED BY

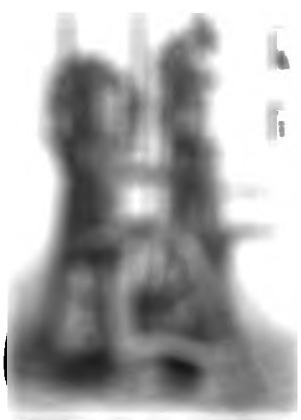
Kroeschell Bros. Ice Machine Co.

29-39 Erie Street, CHICAGO, ILL.

Most simple, economical and durable. Applicable to all commercial purposes.

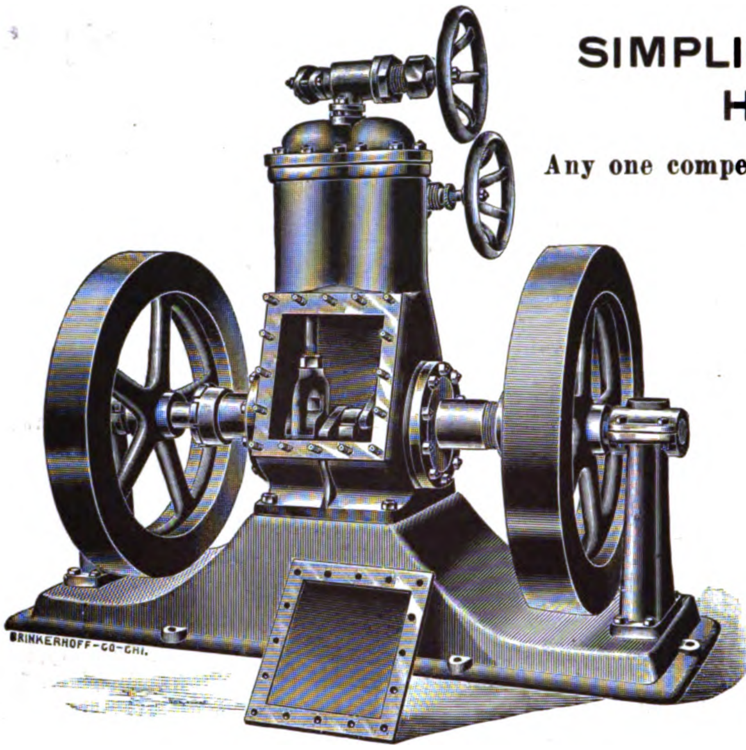
Complete installation for Ice Factories, Breweries, Cold Storage, Packing and Slaughter Houses, Hotels, Restaurants, Candy Factories. Also for Liquefaction of Carbonic Acid Gas.

No destructive fumes or poisonous gases. Complete safety of operation through the introduction of our safety device. Over 1,000 machines now in use.



The Ideal

CHALLONER Perfected Ice and Refrigerating Machines



THREE-TON COMPRESSOR.

SIMPLICITY, DURABILITY, HIGHEST EFFICIENCY.

Any one competent to operate motive power can operate them.

FLOHR-WALTER CANDY CO.
Manufacturing Confectioners, 114, 116, 118 Walnut St.,

St. Louis, August 16, 1897.

Geo. Challoner's Sons Co., Oshkosh, Wis.

Gentlemen: We have your letter of August 14. In reply we are pleased to report that our refrigerating plant is working very satisfactorily. Our chocolate department, cooling room and cold water tanks have given us the required temperature during the hottest kind of weather, and we shall be pleased to testify to the efficiency of your system at any time. Yours respectfully,

FLOHR-WALTER CANDY CO.

We build and install plants from 1 ton up to 25 tons refrigeration.

SATISFACTION GUARANTEED OR NO PAY.

WE WANT YOUR BUSINESS.
WRITE US FOR ESTIMATES.

GEO. CHALLONER'S SONS CO. ENGINEERS AND FOUNDERS . . . 33 Oscoola St., OSHKOSH, WIS.

The BUFFALO Refrigerating Machine Co.

GENERAL OFFICES
Rooms 7 and 8, No. 39 Erie Street
BUFFALO, N. Y.

New York Office
ED BEHN, Manager
141 Broadway

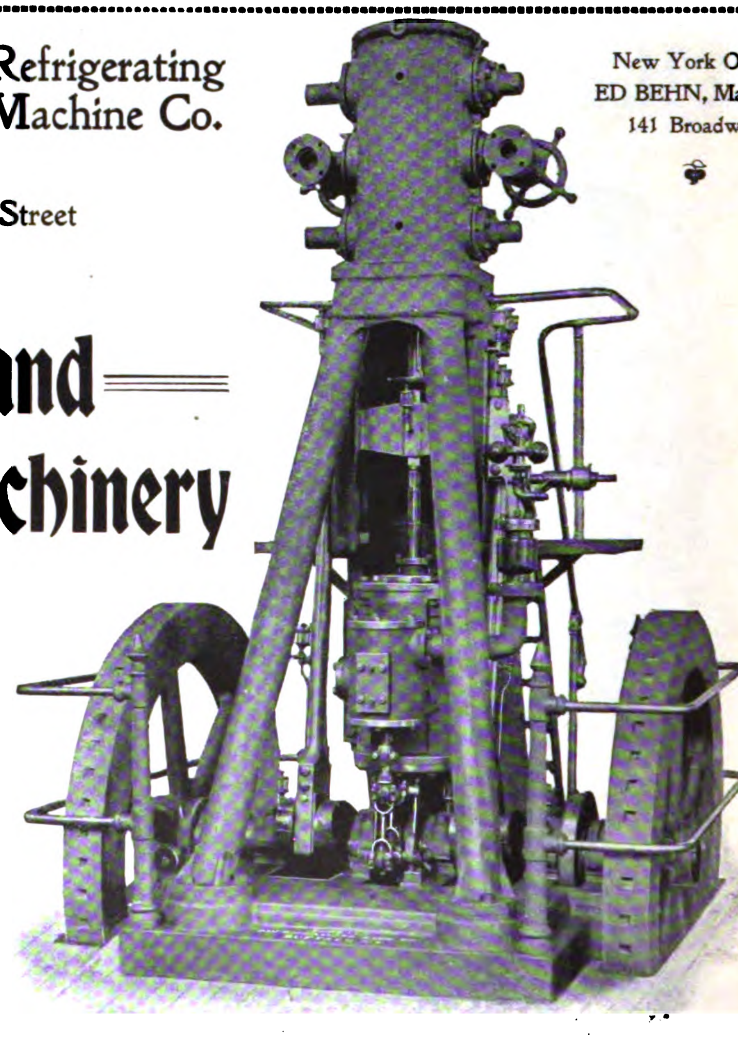
Ice Making and Refrigerating Machinery

BUILDERS OF THE IMPROVED

BUFFALO
VERTICAL
DIRECT-ACTING
Ice and Refrigerating MACHINE

THE SIMPLEST, MOST DURABLE, SUBSTANTIAL AND EFFICIENT MACHINE IN THE MARKET.

Full particulars estimates, illustrated catalogue, list of machines in operation, etc., furnished upon application.



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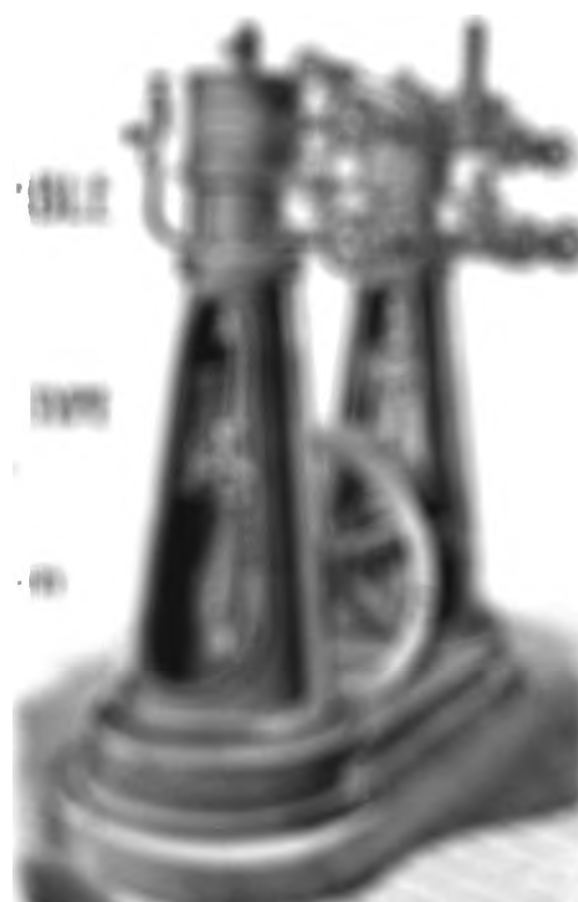
POLAR

REFRIGERATING MACHINES

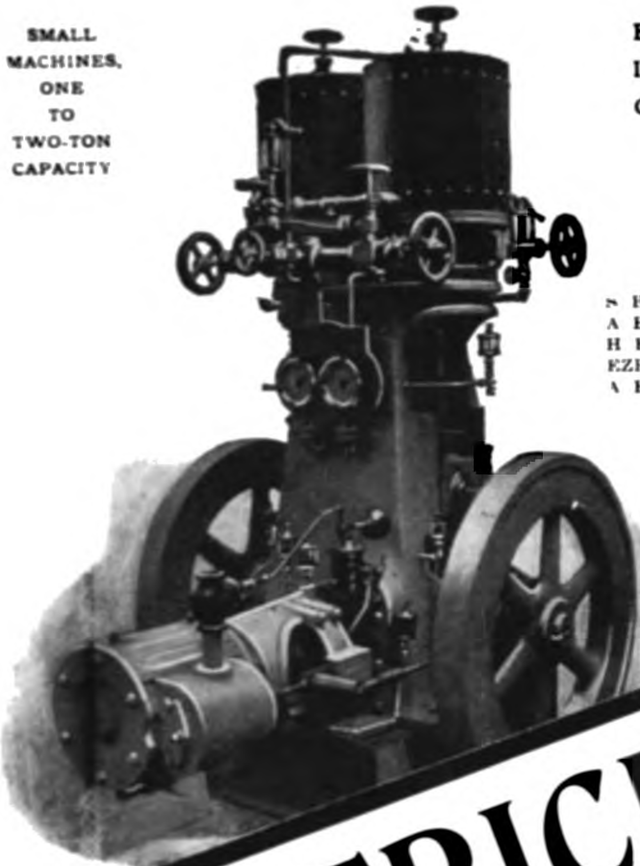


"BOYLE"

Ice Making and Refrigerating Machinery

GLOBE

SMALL MACHINES, ONE TO TWO-TON CAPACITY



ESTABLISHED 1853.
INCORPORATED 1885.
CAPITAL, $1,000,000.

S. B. RINEHART, President.
A. H. STRICKLER, Vice-President.
H. B. STRICKLER, Treasurer.
EZRA FRICK, Gen'l Manager and Sec'y.
A. H. HUTCHINSON, Manager Ice and Refrigerating Dep't.

SMALL MACHINE DIRECT CONNECTED ELECTRIC MOTOR.

FRICK COMPANY

FRICK COMPANY ECLIPSE WAYNESBORO, PA.

...WE... BUILD

ICE MAKING AND R

ICE PLANTS Can or Plate System. Special Machinery for Breweries, Hotels, Creameries, Skating Rinks.

REFRIGERATING PLANTS Direct or Brine System. For Cold Storage and Refrigeration in any of their branches.

CORLISS ENGINES Condensing and Non-condensing. Single Cylinder and Double to Quadruple Compound. Forty to 3,000 H. P. For all manufacturing purposes.

AMMONIA VALVES, FLANGES and FITTINGS of our improved design and best material, same as those supplied with our regular standard plants.

STEAM BOILER PLANTS and TANK WORK Locomotive, Upright and Return Tubular Boilers. Special Tanks for all uses.

OUR FACILITIES for designing and manufacturing enables us to fill your orders satisfactorily.

ICE DUMPING APPARATUS.

Engineers

RUEMMELI & SIEBERT

Refrigerating Machine Company

THE BALL MACHINE

Was Installed during 1899 in the Following Plants:

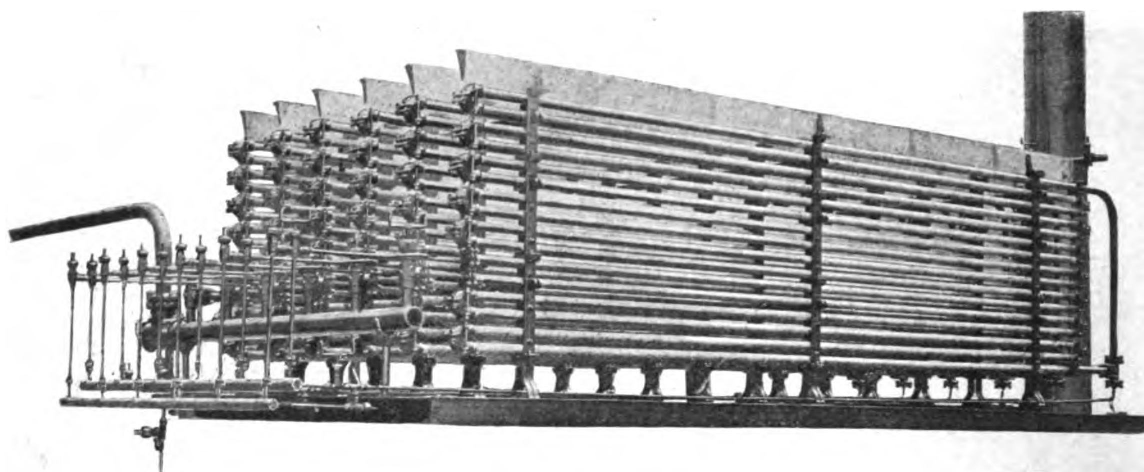
Swift & Company,	One Machine Compound Condensing Engine,	500 tons.
Hammond Packing Company,	Two Machines Compound Condensing Engines,	500 tons.
Nelson Morris & Company,	One Machine Non-Condensing Engine,	250 tons.
Mound City Ice & Cold Stor. Co.,	Two Machines Compound Condensing Engines,	500 tons.
Columbia Brewing Company,	One Machine Non-Condensing Engine,	250 tons.
Capitol Brewery Company,	One Machine Non-Condensing Engine,	75 tons.
Union Brewing Company,	One Machine Non-Condensing Engine,	50 tons.
Poplar Bluff Ice Company,	One Machine Non-Condensing Engine,	50 tons.
Malden Ice Mfg. Company,	One Machine Non-Condensing Engine,	25 tons.
Citizens Ice Company,	One Machine, Absorption,	50 tons.
Wm. E. Ralph,	One Machine, Absorption,	50 tons.
Peoria Ice Company,	Generator-Condensers, etc., Absorption,	100 tons.
Vigo Ice Company,	Generator, etc., Absorption,	100 tons.
Hammond Packing Company,	2-inch Direct Ammonia Piping,	150,000 feet.
St. Louis Dressed Beef and Provision Company,	2-inch Direct Ammonia Piping,	50,000 feet.

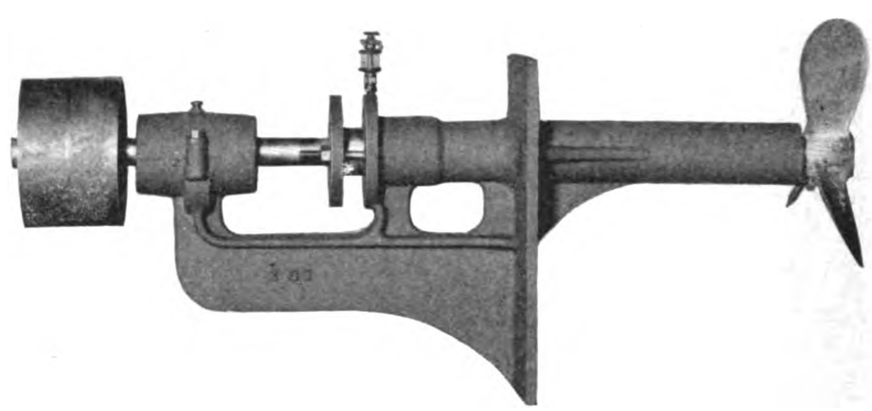
THE above 500-ton machine, installed for Swift & Company, the largest packers in the world, is the fourth machine of this size and tenth order furnished them . . . It is therefore unnecessary to speak of the durability, economy, efficiency and general success of this machine . . .

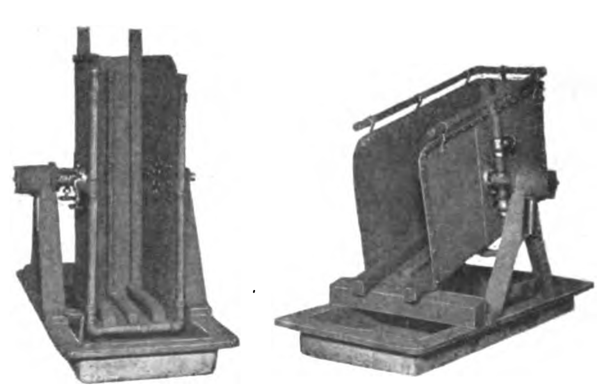
ICE & COLD MACHINE COMPANY

ST. LOUIS, MO.

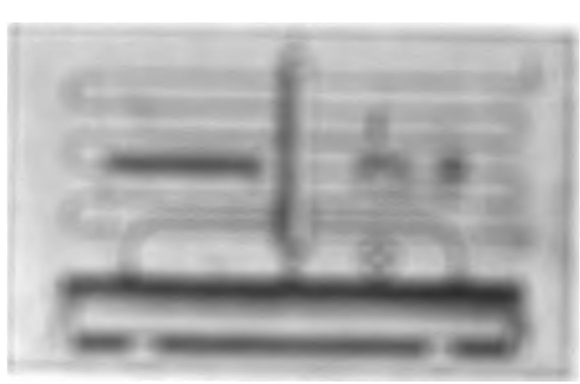

ICE AND
REFRIGERATION
ILLUSTRATED







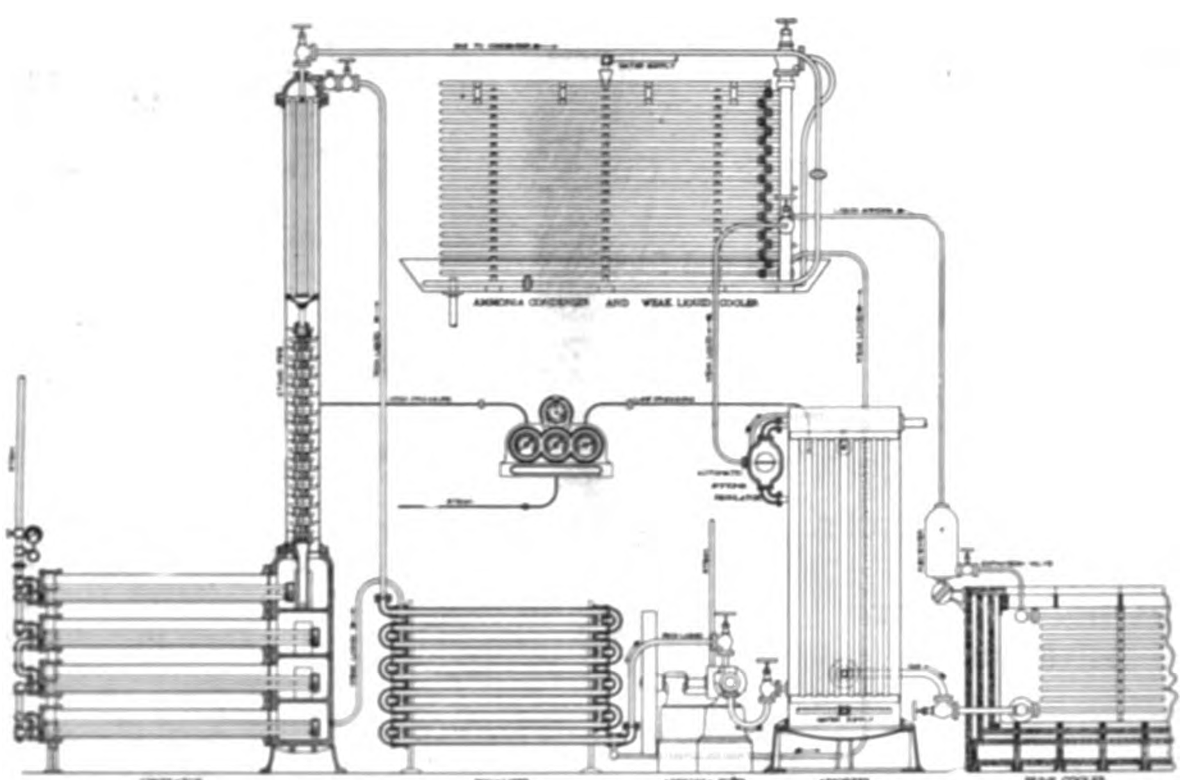
ng Plants



VOGT MACHINES

VALUE
OBVIOUS
GUARANTEED
THROUGHOUT

NO BENT PIPES OR COILS SUBMERGED IN AMMONIA
PAT. GENERATOR DELIVERS DRY GAS TO CONDENSER



Section showing our Complete Modern Absorption Machine, showing Atmospheric Condenser.

MACHINES {ALL SIZES} EVERY PART BUILT AT OUR WORKS

PARTIAL LIST OF ORDERS JUST RECEIVED:

ST. LOUIS REFRIG. AND COLD STOR. CO., St. Louis, Mo. [illegible]	100 tons
LIMA PURE ICE CO., Lima, O.	50 tons
PEOPLES ICE AND COLD STORAGE CO., Owensboro, Ky.	40 tons
T. H. MOORE, Montgomery, Ala.	30 tons
ERNEST HOFFMAN, [illegible], Mo.	25 tons
MAYFIELD COAL AND ICE CO., Mayfield, Ky.	30 tons
J. E. BLACKBURN, [illegible], La.	15 tons
SLIDELL ELECTRIC LIGHT ICE AND COLD STORAGE CO., Slidell, La.	10 tons
[illegible], Tenn.	10 tons

ALSO ADDITIONS TO THE FOLLOWING PLANTS

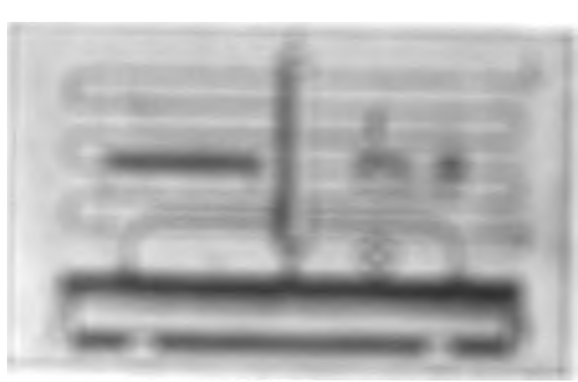
DIAMOND ICE AND COLD STORAGE CO., Seattle, Wash.	100 tons
LOUISVILLE COLD STORAGE CO., Louisville, Ky.	100 tons
SWANNANOA ICE AND COAL CO., [illegible], N. C.	60 tons

ADDRESS ALL COMMUNICATIONS TO

HENRY VOGT MACHINE CO.

WRITE FOR NEW CATALOG

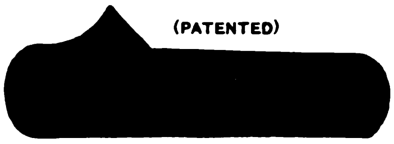
LOUISVILLE, KY., U. S. A.



GRANITE ROCK WOOL

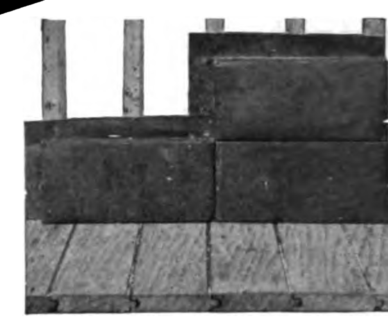
Granite Rock Wool Sectional Covering...

(PATENTED)



FOR HIGH AND LOW PRESSURE STEAM PIPES.

INSULATION FOR BOILERS TANKS, HEATERS, ETC.

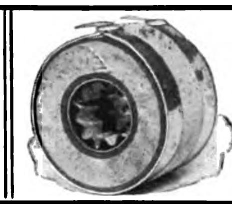


IS PURE ROCK FIBER

WILL NOT PACK DOWN OR DISINTEGRATE. REQUIRES 4,500 DEGREES OF HEAT TO PRODUCE IT FROM GRANITE—NOT SLAG WASTE. IS AS DURABLE AS THE GRANITE ROCK FROM WHICH IT IS PRODUCED.

NON-PENETRABLE AMMONIA and BRINE PIPE COVERING.

MOST EFFECTIVE. REDUCES TEMPERATURE OF BRINE 20 DEGREES. PATENTED.



WATERPROOF NON-CONDUCTING TANK COVERING

SECTIONAL COVERING FOR EVERY PURPOSE.

SAWYER'S POLAR BRAND INSULATING PAPERS
SAWYER'S ALASKA BRAND INSULATING PAPERS
SAWYER'S POLAR BRAND INSULATING PAINTS

SAWYER'S HIGH GRADE INSULATING PAPERS AND PAINTS

GRANITE GRAPHITE PAINTS
"NO BURN" GRANITE COLD WATER PAINT
GRANITE ROCK FILTERING FIBER

WRITE FOR DESCRIPTIVE PAMPHLETS AND CIRCULARS FOR ALL OF ABOVE MATERIALS TO THE

American Insulating Material Mfg. Co.

SOLE MANUFACTURERS OF

GRANITE ROCK WOOL

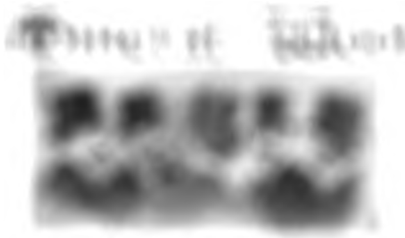
WE CARRY ON HAND AT ALL TIMES 500 TONS OF GRANITE ROCK WOOL, SO AS TO ENSURE PROMPT SHIPMENT ON RECEIPT OF ORDERS.

LARGEST EXCLUSIVE MANUFACTURERS OF
Insulating and Fireproofing Materials
IN THE WORLD.

General Offices, 213-215 N. Third St., ST. LOUIS, MO.

FACTORY AND WORKS, - - CARONDELET.
OFFICES, 2006 BALTIMORE AVE., KANSAS CITY, MO.
OFFICES, 506 GREAT NORTHERN BLDG., CHICAGO, ILL.

MINERAL WOOL



P & B
PAINT

ICE AND REFRIGERATION ILLUSTRATED

A Monthly Review of the Ice, Ice Making, Refrigerating, Cold Storage and Kindred Trades.

VOL. XVIII. No. 4. CHICAGO : NEW YORK : APRIL, 1900. $2.00 PER ANNUM.

[*Special Report Made Expressly for* ICE AND REFRIGERATION.]

Ice Manufacturers' Conventions for the Month.

FULL REPORT OF PROCEEDINGS OF THE SIXTH ANNUAL MEETING OF THE INDIANA ICE MANUFACTURERS' ASSOCIATION, AND THIRD ANNUAL MEETING OF THE NORTHERN ICE MANUFACTURERS' ASSOCIATION—PAPERS READ AND DISCUSSED—ELECTION OF OFFICERS—LIST OF DELEGATES—PORTRAITS.

PURSUANT to call as per the official announcement published in the columns of ICE AND REFRIGERATION, members of the Indiana Ice Manufacturers' Association and of the Northern Ice Manufacturers' Association met in joint session at the Commercial club rooms on Tuesday, March 13, in the forenoon, and in the afternoon enjoyed a trolley ride. On the forenoon of Wednesday, the 14th, the Indiana Association held a separate session at the club rooms, while in the afternoon the joint session was again resumed, to listen to the papers read, and to secure the largest participation in the discussions, which proved to be of great interest and of considerable practical value to all present. The social side of the meetings was also much enjoyed.

GROUP OF DELEGATES TO THE INDIANA AND THE NORTHERN ICE MANUFACTURERS' ASSOCIATIONS, MARION, IND.

Among those present at the meeting of the Indiana and Northern Ice Manufacturers' Association were the following active and associate members:

LIST OF DELEGATES.

Chas. G. Barley, Marion Ice and C. S. Co., Marion, Ind.
J. L. Barley, Marion Ice and C. S. Co., Marion, Ind.
A. Bell, Connersville Ice Co., Connersville, Ind.
J. J. Corbett, Indiana Brewing Association, Marion, Ind.
Fred. O. Eward, Marion Ice and C. S. Co., Marion, Ind.
B. F. Fettig, the Home Storage and Manufacturing Co., Elwood, Ind.
John H. Frank, Alexandria Ice and Cold Storage Co., Alexandria, Ind.
H. K. Helton, Home Artificial Ice Co., Bloomington, Ind.
P. M. Henley, Independent Ice and Fuel Co., Richmond, Ind.
F. S. Howard, Standard Paint Co., Chicago.
F. C. Johnson, Crystal Ice Co., Anderson, Ind.
J. M. Leach, J. M. Leach & Co., Kokomo, Ind.
H. H. Leach, J. M. Leach & Co., Kokomo, Ind.
T. J. Louden, Home Artificial Ice Co., Bloomington, Ind.
Thos. Mahaffy, Indiana Brewing Association, Marion, Ind.
Geo. G. Manning, Crystal Ice Co., Anderson, Ind.
W. K. Martin, Crawfordsville Ice and Cold Storage Co., Crawfordsville, Ind.
Fred Matthews, Home Artificial Ice Co., Bloomington, Ind.
G. W. Neal, Frankfort Ice and C. S. Co., Frankfort, Ind.
J. F. Nickerson, ICE AND REFRIGERATION, Chicago.
W. M. Pearce, Innis, Pearce & Co., Rushville, Ind.
Geo. Rettig, Union Ice Co., Richmond, Ind.
Otto Rettig, Union Ice Co., Richmond, Ind.
K. G. Sample, Muncie, Ind.
Alfred Siebert, St. Louis, Mo.
Robert J. Spencer, Marion Ice and C. S. Co., Marion, Ind.
S. P. Stevenson, Stevenson Door Co., Chester, Pa.
Thos. R. Shearer, stenographer, ICE AND REGRIGERATION, Chicago.
C. A. Van Gorder, Marion Ice and C. S. Co., Marion, Ind.
Henry Vogt, Henry Vogt Machine Co., Louisville, Ky.
Will H. Watts, Knightstown, Ind.
Wm. M. Woodrow, Chillicothe Ice Co., Chillicothe, Ohio.
J. W. Young, Toledo Ice and C. S. Co., Toledo, Ohio.

The Indiana Ice Manufacturers' Association.

FIRST DAY'S SESSION.

The meeting was called to order at 11:15 A. M. by President J. M. Leach, who introduced Mayor W. L. Golding, of Marion. Mayor Golding delivered a short address of welcome and extended the liberty of the town to the delegates. Mr. J. H. Frank thanked the mayor and apologized for the small attendance, stating that there were a number of trains coming in during the day which would bring more delegates, and promised that next day they would have a larger attendance.

Mr. Eward asked for an expression of opinion as to the desire of the delegates to attend the performance at the Grand Opera house in the evening, and it was moved and carried that they attend.

Mr. FRANK: Gentlemen, we have a half hour. Why not have some one give us some information on the liquid air question? Mr. Nickerson might give us some information.

Mr. NICKERSON: Gentlemen, I don't know that I can give you any new information regarding liquid air. I presume you are all familiar with the experiments and demonstrations that are made by Tripler and others who give lectures on the subject; but, as far as liquid air being a commercial success, that is something yet to be demonstrated. Tripler has done nothing in a practical way as yet. He is, however, just now organizing a $10,000,000 company, and I presume probably that accounts for the number of lectures that he is giving throughout the country, although I am informed that in Chicago he lectured at the rate of $2,500 a night, and I presume he is willing to keep up the interest in liquid air on those terms indefinitely. The only successful plant, so far, that is making liquid air to any extent is that of Ostergren & Berger, in New York city. They have, I understand, quite a fine plant there, very complete, and are making considerable liquid air, but they are merely selling it to hospitals for medical purposes and for experimental purposes. They say that they are not talking about it at all as to its possibilities in a commercial way for refrigeration or ice making, but that they are making experiments on that line, and they are not selling machinery or stock. They are evidently a concern who are making real experiments to ascertain what can be done. It is stated by Professor Siebel and other eminent scientists that the refrigerating effect of a pound of liquid air is not any greater than a pound or a pound and a half of ice, and if that is so, it disposes effectually of the fear of liquid air competing with ice. Of course, a pound of liquid air must cost a good deal more than a pound of ice, as manufactured at present.

Mr. WOODROW: Do you not really think, Mr. Nickerson, that it is practicable? I mean in its application.

Mr. NICKERSON: No, not for refrigeration. I do not believe it is possible, in an economical manner.

Mr. VAN GORDER: Mr. President, I would like to hear from Mr. Vogt.

Mr. VOGT: *Mr. President and Gentlemen:* I really confess that I know very little in reference to liquid air, only that I had the pleasure last Friday night of hearing a lecture on the subject. The lecturer, Professor Freer, had some liquid air there to show the audience. The most attractive part was to see the liquid air, but there wasn't anything shown except in a crude way. He took some alcohol or whisky, and put it in a glass, and put it down in the liquid and froze it, and he did that in order to show that there wasn't any thermometer that would indicate the temperature that would be reached. My judgment is--and in fact he stated—that there weren't any commercial purposes that it could be adapted to successfully. There were a number of questions asked him, and in every instance he said that he did not know what the outcome of it would be; that it wasn't new, but was just in its experimental stage. He afterward said that, as far as preparing it for ice making purposes was concerned, or using it in that way, he thought it would not come in competition with the machinery in use for ice making at the present time.

Mr. FRANK: Mr. President, we have a gentleman with us to-day who has rather deserted us the last few years, and has gone into a more profitable business. He is back to-day to renew old acquaintances, and make some new ones if possible. We would like to hear from Mr. Sample as to how the zinc business is.

Mr. Sample stated that the zinc business had its drawbacks, the same as the ice business, but there was one advantage, that they had no collectors, and got a check every week for the entire output.

On motion, an adjournment was taken until Wednesday, March 14, 10 o'clock A. M.

THE TROLLEY RIDE.

After dinner the delegates assembled at the Burrier hotel, and in a body took special electric cars for a trolley ride about town. A run of seven miles was taken through some of the principal streets of the city, to Jonesboro and Gas City. A visit was made to the factory of the American Tin Plate Co., at the latter place. The delegates were very much interested in the inspection of this plant, especially so, as permission to visit these mills is very rarely granted and was extended to the visiting ice men as a special mark of favor. A visit was then made to a glass bottle works, after which the party boarded the electric cars and were carried to the plant of the Marion Ice and Cold Storage Co. At the ice works the delegates were served with liquid refreshments, and much interest was manifested in the equipment and operation of this model ice plant. The next establishment visited was that of the Indiana Brewing Association, where the ice men were most hospitably received and entertained by Mr. Mahaffy, treasurer, and Mr. J. M. C. Woelfel, superintendent and secretary, and were regaled with the celebrated brews of this brewery. From the brewery the delegates proceeded to the hotel, where dinner was served; and afterward at the invitation of the local members, they attended the performance of "Corinne" at the Grand Opera house.

FRED MATTHEWS, BLOOMINGTON, IND.
Vice-President Indiana Ice Manufacturers' Ass'n.

W. K. MARTIN, CRAWFORDSVILLE, IND.
President Indiana Ice Manufacturers' Ass'n.

F. C. JOHNSON, ANDERSON, IND.
Sec'y and Treas. Indiana Ice Manufacturers' Ass'n.

SECOND DAY—MORNING SESSION.

The meeting was called to order at 10 A. M. by President Leach.

President LEACH: Our secretary has very kindly prepared a programme for this morning's proceedings. I see he has, as the very first thing on the programme, an address by the president. Of course, that is a joke. That is entirely out of the president's line. I have never attempted to make an address at a public gathering, and I believe I am a little too old to learn now; so we will pass that. I want to say, however, that I feel very much interested in this organization. I think it is important to the ice manufacturers from a social, as well as business standpoint, and should be maintained and encouraged. I know personally that we receive quite a little benefit in a business way and in divers ways from this organization, and I have no doubt that the rest of you feel the same way about it. We are able to keep off of one another's toes, and that is quite an item, you know.

The next thing in order is a report of the natural ice crop. I will be very glad to hear from anybody.

Mr. FRANK: Mr. President, I want to make a suggestion or a motion, that the papers prepared for this morning's meeting be postponed and be read this afternoon at the Northern meeting. We have made arrangements to have the same papers at both meetings, and I suggest that we have the meeting this morning for a general discussion of any subject that any of the members have to offer or that they wish to discuss, and carry the other part of the programme over until afternoon. [The motion was seconded and carried.]

President LEACH: This report of the natural ice crop of course is not in the form of a paper, and it is one of the things that is open for discussion. We ought to know who has got natural ice, and how much, and we would be glad to hear from any of you on that subject.

Mr. VAN GORDER: *Mr. President and Chairman:* With regard to the natural ice crop of this county, as far as my knowledge and observation go, there has been a medium crop of fairly good ice put up. Nearly every ice man has put up a small quantity of ice, running from seven to ten inches without snow, and later on they put up ice perhaps nine inches thick with more or less streaks of snow in it, and I think that this year's crop is about two-thirds of what it was last year, and the ice is hardly as good as it was last year. There is some old ice ice left over, but I notice that the feeling among ice men—that is, men that handle considerable quantity—is that there is a shortage. You can see that in their prices. They demand an advance of perhaps twenty-five cents a ton over last year's prices. That would naturally lead one to infer that

there was a slight shortage. The quality of the ice this year, especially on the first cutting, is as fine as I ever saw. Ice put up here and at Warsaw was perfectly clear, and there wasn't a bit of snow. We put up ice this year when the dust blew, just as in the summer time. Of course if the lake or the ice is situated close to the road they get a little dust on their ice, but outside of that they had no snow to contend with, and it was fine. I don't think the crop put up will meet the demand during the season. I think later on there will be a shortage to fill. I know that will work to the advantage of all of us who manufacture ice. I think the shortage will have a tendency to keep prices firm during the season.

Mr. MANNING. I know very little about it in addition to what Mr. Van Gorder has said. I think that we have hardly an ordinary crop of natural ice in our vicinity.

Mr. VAN GORDER: Mr. President, we have some parties here that put up ice in different parts of the state. We would like to hear from them.

Mr. MARTIN: We secured enough ice to fill all our houses, having some left over from last year. We were compelled to run nights to do this. We cut the ice on the first freeze. That was the best ice that was frozen this year in our locality. We got ten inches of clear, hard ice without any snow in it. We were advised by the weather bureau at Indianapolis as to the condition of the weather and what was to come, and, acting on their advice, we ran our force at night. In that way we filled our houses. That first freeze went out. The second freeze at our place only reached the thickness of scant seven inches. The third freeze, that is, the last one, reached six and one-quarter inches. We considered ourselves very fortunate in getting our crop off of the first freeze. The smaller towns around in our section secured ice ranging from five inches to eight inches. They have what you would call a moderate crop. I don't think the Indianapolis district secured any more than half the crop, if they got that, and of a poor quality. That is the information I gather from the newspapers and an interview over there with one of the dealers. The first freeze they delayed just a little too long, and got only two days cutting off of it. Of course, the ice softened and they had to stop. Then it lost considerable in its thickness. They got some on the second freeze, but the quality of it wasn't very good.

Concerning the lake district, I don't know very much about La Porte, but Armour, at Cedar lake, cut a large quantity of ice. During the first freeze he loaded an average of 100 cars a day there and shipped it to Chicago and to his various stations. Some of it went to Vincennes and other points where he has cold storage rooms. He filled his main building, and I think filled a temporary house about one-half or two-thirds full. He has a house there that he fills, and then immediately after the cutting season is closed, he loads that and ships it right out. I think that they got ice at Cedar lake about eleven inches thick. The ice, of course, that Armour cuts is principally for his own ice stations, and he is not very particular about the quality of it. There has been no ice cutting on the south end of Cedar lake on the first freeze. Why it was I do not know. There are two large houses located down there, and I don't know the reason they didn't cut. They possibly got some on the second freeze. La Porte failed to get any ice, I am informed, on the first freeze, and I would presume that they cut on the second freeze, but not the best. They held over some ice from last year. In fact, there has been some ice at all points held over from last year's harvest. Maxintucky got no ice on the first freeze. They commenced cutting, but they were like Indianapolis—they delayed just a little too long. They afterward secured some on the second freeze. I think their ice finally got to be eleven inches, but I am not positive as to the quality of it. They held over some ice from last year. I would judge with Mr. Van Gorder that the crop would be considered about a two-thirds crop, and taken in general, none of the best—probably a fair average quality.

Mr. MATTHEWS: Mr. President, we are a little too far south for natural ice, and there is very little stored down in our neighborhood, none that will interfere in any way with the manufactured ice.

Mr. RETTIG: We got about two-thirds of a crop, and carried some ice over from the year before, and what we got was fine and clear, without any snow or slush, and we got it in in good shape before the thaw. We got some ice on both cuttings, first and second, from eight to eleven inches thick.

President LEACH: Was there much ice cut in the neighboring towns?

Mr. RETTIG: My understanding is, all the neighboring towns got about the usual crop.

President LEACH: The next on the programme is a discussion of the mutual insurance company question. Mr. Howard Leach's name is mentioned. I don't know whether he has anything on the subject or not. It is an important matter, and ought to be discussed.

Mr. HOWARD LEACH: When the secretary wrote me, some two or three weeks ago, that he wished I would get up a paper on the subject of mutual insurance among the artificial ice plant men, I am afraid he asked me to do something that I knew very little about. But I have had a talk with the secretary of the Farmers' Mutual Insurance Co., and of course he lauds it to the very sky, and I have talked with several members of the Association. I did not have opportunity to prepare a paper, and, in fact, did not really know where to go to get any data, and I did not feel that I understood the subject well enough myself to get up a paper of my own knowledge, and I think the best way to bring that subject before the meeting would be by a general discussion. Some are for it, while some do not seem to take kindly to the idea. One or two expressed the idea in this way: that while all ice plants are no doubt managed to the very best interest of the individual, yet some are better equipped and arranged for prevention of fires, and consequently the better handled plants would be paying the losses incurred by those that were not so well protected against fire. I am very sorry that I was not able to prepare a paper on it, but I think if we start a general discussion it will give us better ideas than I could give you myself.

President LEACH: I think, gentlemen, this is an important matter, and a pretty free discussion of the subject would be in order. We will be glad to hear

Mr. VAN GORDER: Mr. President, I have given the matter of insurance on ice plants some little thought, and just now occurred to me a plan, which I think would be a good one for this Association—something on the line of Mr. Frank's remarks. Suppose that the members of this Association should each one pay in 15 per cent of the amount of insurance they paid in last year. Put that in a general fund, and have a committee appointed of representative business men from this Association to manage it. Put that money out at interest, the same as any other insurance company does. When we don't need it, put it where it will be drawing interest. Then every year, if necessary, make an assessment, and, if not necessary, let the fund gradually accumulate, and whenever it becomes necessary, if we have n't enough, add a little more to it. I am satisfied that 15 or 20 per cent of the amount we now pay would insure us.

President LEACH: Do you mean to say that you would drop your present insurance entirely?

Mr. VAN GORDER: I would carry part of my present insurance and cut it down one-half, and start a mutual company.

President LEACH: Don't you think the insurance companies would raise our rates if there was a scheme of that kind?

Mr. VAN GORDER: I don't think they would, because they would know that they would lose us sure then. Before, we went to them and said, "You cut down our rates or we will quit you." They said it was impossible to cut it down, but they did cut it down. Many will tell you that you can't make such a company a success, but I don't see any reason why we couldn't. We could start an insurance company among ourselves, like the other mutual fire insurance companies. They make money out of it; why can't we? Suppose the members should every one pay in the amount of insurance they pay for one year, that would certainly insure every member of this Association for a year. It would make a pretty good fund. The interest on that would pay our losses, and we could keep right on. If it pays the insurance company, why won't it pay an organization like we have here? There hasn't been an ice plant burned in this state. There may be one next year, and there may not be one for ten years. If the amount we pay in for insurance was carried along for ten years, it would be enough to buy half a dozen ice plants. They tell us they can't afford to insure us any cheaper. If we never have a loss, and pay them from 1½ to 2 per cent, I think they can. We might as well have the advantage of it. There is no use of us paying our good money out when we can arrange it so that we will not have to do it. That is what we run our business for, to make money where we can. If we pay $200 or $300 a year, and we can save that, we are $200 or $300 ahead. Every concern in this Association is composed of business men; and what is the reason we cannot manage an insurance company as well as we can manage the ice business? A great many of us have conditions to meet in the ice business that require very good ability and tact to overcome, and if we can overcome them we can certainly overcome matters that come up in the insurance business. I would like to hear from the other gentlemen.

Mr. WATTS: Mr. Van Gorder, I would like to ask you a question. In organizing a regular insurance company do not the state laws require that a certain amount of business must be carried, in order to incorporate as a mutual insurance company and do business in the state of Indiana?

Mr. VAN GORDER: For a regular fire insurance business they do.

Mr. WATTS: Another question comes to my mind, as to new members coming in or a new man that wants to join this Association, what rate of insurance are you going to charge him? Will you make a rate for all ice plants in the state of Ohio or Indiana?

Mr. VAN GORDER: Make a rate for members, and if there are outsiders charge them more.

Mr. WATTS: Start out as charter members?

Mr. VAN GORDER: Yes, and after that have an initiation fee and charge them whatever is a fair per cent.

Mr. WATTS: You have got to conduct the business according to the laws of the state of Indiana. Where I am located I cannot get insurance for less than $2.80 on the hundred. I do not carry any insurance on my plant. I have a night watch, and I watch quite a good deal myself. I have a brick fire wall in my engine room, and I have water hose connected to my general supply pump in the factory, so if at any time a fire breaks out I can turn the water on from my own pumps; and I have also a hydrant from the city, and hose that I can attach to that. I would, however, like to see a mutual company formed.

Mr. FRANK: Mr. President, I would like to speak again on that question. I got my eyes opened when I was over at Columbus two years ago, March 15. I learned from the members there that where they had frame cold storage buildings, they were paying only 1 per cent. I came home and jumped on to our insurance companies about it, and the only reason they could give for it was that there were so many mutual fire insurance companies in Ohio, and on account of the strong competition which they had to meet. The fact of the business is just this: A number of general agents have told me—and I always tackle all of them on this question—they say this, that until ten years ago there were very few ice factories in the north, and that for the first few years they charged us the rate that they charged on a natural ice house, where natural ice was being stored, covered with straw and various inflammable materials, and they were afraid to cut the rate, but knew it was too high, and said that the manufacturer of ice in the north was in competition with the natural ice, and that the success of the business was doubtful and they were afraid that there were too many ice manufacturing companies organizing, and that they couldn't make it pay and they would simply put a match to the plant and sell it out to the insurance company. It hadn't been demonstrated to them that the manufacturing of ice in the northern states was a profitable investment, and for that reason they kept up this high rate.

If you will take the number of fires that have occurred in the northern states, it is remarkable what a small per cent of losses there have been in ice factories. The fact of the business is, one-half of the ice plant is submerged in water or ice. Take the average

tual insurance company for our mutual protection, and then submit it to the different members of this Association for their approval or disapproval. Then we can have something definite. Of course this way of discussing it each time when we meet may avail something, but if we do as we did at Indianapolis, and as I believe the Southern Association of ice makers did—adjourn without doing anything—there will never be anything accomplished by this Association.

Therefore, Mr. President, I move you that the chair appoint three members of this Association to call on the state board of fire underwriters and demand a rate which is a living rate for us and good business for them; and if that committee should fail before that board, that they be authorized to draw up articles of association for a mutual fire insurance company of ice makers of Indiana, Ohio and Illinois, and report to the different members the results, so that we may approve or disapprove of their action. [The motion was seconded by Mr. Watts.]

Mr. RETTIG: Now, after our discussion at Indianapolis last year, we secured a rate of 2 per cent; the year before the meeting we were paying 2½ per cent. I went home and made a kick, of course, to our insurance man, and a reduction was made to 2 per cent. Then I made a kick that it ought to be 1½ per cent. I knew some of our other members were getting their insurance at that rate. They insured the property at the rate of 2 per cent, with the understanding that when their general agent, that is, Mr. Macbeth, came around, if he would take it at 1½ per cent, I was to get a rebate; and he came along in June or July, along the middle of summer, and I got a rebate. They have taken our plant at 1½ per cent, and I think that our discussion last year at Indianapolis helped us to that; but, of course, it varies with the difference in location.

Mr. LOUDEN: We are isolated.

Mr. RETTIG: There is no reason you shouldn't have the rate we have, and I cannot understand why your rate, Mr. Watts, should be $2.80.

Mr. WATTS: A lumber yard is just east of me.

Mr. JOHNSON: Do you consider 1½ per cent an exorbitant rate?

Mr. RETTIG: I think 1½ per cent is a big rate. I think it should be 1 per cent. Take an ice plant, and especially when they are in operation, they have plenty of water to take care of their own fires. We have hose that we can connect, and could take care of our fire until the fire department came. We have a good department in our town.

Mr. EWARD: Mr. President, at the meeting last year at Indianapolis the question of insurance on Mr. Bell's plant at Connersville was taken up. Mr. Macbeth did not want to give him a rate, and I will ask Mr. Bell how he got that matter straightened out.

Mr. BELL: I am away out by myself, plenty of water plugs there. I never had any fire, and don't expect to have, but they said that I must pay that rate. They said there was no such thing as a cheaper rate. I spoke to Mr. Eward, and he informed me there was, and even then they wouldn't give up. They said there was no such thing going, and that I would have to pay 2½ per cent. We went to Mr. Macbeth, and we secured 1¾ per cent. I told him that there was never a time in my remembrance when an ice plant burned in the state of Indiana, and that on account of being located as I was, I demanded a cheaper rate. I will be one to take the lead in forming a company if we can make this rate lower. About this committee, I think this committee ought to act at once. I will have to insure pretty soon, and I don't want to pay $1.75 again.

Mr. EWARD: I believe, with Mr. Rettig, that if this gentleman from Bloomington, or any of the members that are paying more than 1½ per cent, will go to the insurance companies as members of this Association they can have their rate cut down. I believe they could have had it done before this if they had taken the matter up.

Mr. RETTIG: I think that our agents have a good deal to do with that. One of my agents, the first one that I talked to, said: "Your rate is reasonable, and we cannot get any reduction." I said: "I will not insure; you can't have my policy; I will not take it out until I see the other agents." I went to one of the other agents, talked to him, and he said that he would have to get it reduced; that he thought the rate was high. I went to another one, and he sat right down in my presence and wrote to Mr. Macbeth and to the general agent at Indianapolis describing our building and the rates, and in two or three days afterward this agent who had said that he couldn't take it at that rate, and that he thought the rate was low enough, came with a policy and said that he could take it, and that his company would take the risk at 2 per cent, and if the company would give a rebate he would get it and that he thought he could get it at 1½ per cent, but I didn't take my policy with him. I took my policy with the agent that had made an effort to get my insurance reduced. Of course his commission was less than if he had got the 2 per cent. I think that our agents have a good deal to do with it.

Mr. LOUDEN: I would like to ask what is your plant, frame or brick?

Mr. RETTIG: It is frame, and we have no brick partitions between our boilers and ice plant. We have a board partition, frame building, with an iron roof.

Mr. LOUDEN: I took this matter up, representing our company, with the local secretary of our board of underwriters and I made a personal appeal to four of the city agents of the insurance company, and they wrote me a letter in which they said that they had prevailed on the Association at Indianapolis to allow us to have the lowest board rate for ice plants, and Mr. Macbeth came there and said that the regular board rate was 2½ per cent, and instructed the secretary of the local board that the rate should be 2½ per cent, and wouldn't give them any other rate. Our plant was discussed by the state board at Indianapolis. I didn't know the date of their meeting or I would have been there. It was taken up and discussed and was left entirely with Mr. Macbeth, and I can't say why it is we paid 2½ per cent, and you folks with frame buildings the same as ours pay 1½ per cent or 1¾ per cent. I think it should be 1 per cent. I would favor paying 1 per cent to a regular insurance company more than I would favor a mutual company; but when it gets beyond 1½ per cent I think it

is just that much to the interest of the Association to have a mutual company.

Mr. MANNING: What is your rate, Mr. President?

President LEACH: One and one-half per cent. They made us a rate shortly after last year's meeting. That "chinning" we gave them down at the other meeting did a good deal of good.

Mr. MARTIN: I think the agitation will do considerable good. If I remember right, this was first started at Alexandria. We were paying 3½ per cent. It was reduced to 2. We are at present paying 2 per cent. We have a hydrant within 150 feet of the city water works, and fire alarm within 150 feet. We have a stand pipe in our factory, pressure direct from the city water works, with a hose connection, 2½-inch opening, and 100 feet of hose. We also have at one side of our building an inch connection and about thirty feet of hose, which would protect that side in ordinary cases, and a fire wall between the boiler and machine room, steel roof, and we still pay 2 per cent. But I think the main trouble with the insurance companies has been, as Mr. Frank said, that they base their rating on natural ice house insurance. At present we are paying 5 per cent on natural ice house insurance, and you can borrow all the money you want at that rate. One of the reasons for that, as stated by the insurance company, is that in a fire in a natural ice house there is very little salvage. At least 75 per cent, if not a greater per cent, of natural ice houses are built outside of fire protection. They are outside of the city limits and, of course, that makes a higher rate. Another thing, a large per cent of the ice houses are fired by lightning. You men that are in the natural ice business know how hot it is up in the roof of a natural ice house in the summer time. It seems paradoxical, but I think it is the hottest place on earth. You take a hot day and get up under the roof, and there is a heat generated there that is suffocating. All these things have a bearing in making this 5 per cent rate. They have formed their rates on this and on the question of salvage. It has to be a very serious fire in an ice factory—explosion or something like that—in which you do not save your tanks and cans and what ice is in your tanks, and parts of the machinery.

I believe that the agitation started here to-day will result in a lower insurance rate. I know the other one helped me out 1½ per cent. I would like to pay 1 per cent, but I am paying 2.

President LEACH: You can safely claim that this Association has been of some benefit to you.

Mr. MARTIN: It has undoubtedly, Mr. Leach.

Mr. HOWARD LEACH: In a paper before the Southern Ice Exchange, a report of which was in ICE AND REFRIGERATION, the point was made that anhydrous gas was a great destroyer in itself of fire, so an ammonia pipe would be as good as a chemical extinguisher itself. That is a point, I think, that could be well made in attacking an insurance board.

Mr. RETTIG: Gentlemen, I don't see why an ice plant is any more risky than a dwelling house. I think it is safer. There is not as much risk in the ice plant as an ordinary dwelling house, and why the rates should be any higher I don't know. We have protection generally, and, if it gets on fire, we can put it out. Most of our ice houses are protected more or less. Those ice houses of course are dangerous, but on the ice factory I can't see where the risk comes in.

The president then put the motion of Mr. Louden, which was carried.

President LEACH: We will proceed with other business, and appoint that committee later on.

Mr. EWARD: I would like to ask the members, or have their views in regard to what amount of insurance you should carry on your ice plants, and whether it is good business to carry as much insurance as some of us do on our machines. I would like to hear an expression from some of the members that know something about that. The question has come up in my mind, and I would like to be informed on the subject.

Mr. VAN GORDER: A good way to get that before the meeting would be for each member to state the size of his plant and the amount of his insurance. Let each one give the approximate amount. That would give a general idea of about what proportion of insurance they carry. I would say that as far as our plant goes we carry about $12,000 of insurance on a 20-ton plant. That covers all the insurance.

Mr. EWARD: There is $9,600 on the machinery, and $2,400 on the building.

Mr. MANNING: I don't think it will be possible for Mr. Van Gorder to have a fire that would destroy $9,000 worth of machinery. In my own case I looked the matter over, and couldn't see what would burn. I knew that our absorber would not be burned, and that retorts wouldn't burn, and I was very doubtful about the pipes burning, and it seemed to me the rate was too high, and I preferred that we carry a part of the insurance ourselves, and we reduced it very materially. We have added to our plant, so that we have now a 41 or 42-ton plant, and I think we are carrying to-day only about $8,000 insurance. I couldn't see where we could possibly lose the money if the property should take fire. It seems to me money thrown away.

Mr. RETTIG: We carry about $5,500 insurance on our 15-ton plant.

Mr. LEACH: For our 15-ton plant and barn which adjoins, and horses that we use for other purposes, we carry $10,000, barn, horses, wagons and ice plant and all. I don't remember how it is divided, but I think it is ample as far as the ice factory is concerned. Our barn is a little expensive, and holds many horses, horses, which we use for other purposes besides ice.

Mr. LOUDEN: We carry $9,000 on a 10-ton plant.

Mr. FRANK: Mr. President, I have always said that the majority of us carry too much insurance. Every time we write our insurance I always register a kick. We have a 20-ton plant, all the ammonia condensers submerged in steel tanks, cement floors and brick floors, and I can't see where we could lose, taking the building and everything into consideration. The principal cold storage room is brick, only one opening, and that at the rear end, back of the ice room. That runs ten feet beyond the other building, solid fire wall. The frame could burn away without doing any damage to the main cold storage. We carry $10,000 on the building and machines, and $1,000 on our barn and horses and wagons, and I don't believe that we could meet with more than $5,000 loss. I think we throw away that much money every year.

Mr. EWARD: I would like to hear from Mr. Vogt, whether or not he has ever repaired any ice machines that have burned down—whether they can be repaired.

Mr. VOGT: I haven't had any experience in any plants that we have put up that burned down, and in fact I don't know of any at the present time. My idea of carrying insurance would be not to carry over 25 per cent of cost of machines, because you cannot burn the pipes and materials. You only destroy a very small part of the pipe work. The balance could be worked over. I think you carry too much insurance on your machines.

Mr. FRANK: I would like to hear from Mr. Siebert.

Mr. SIEBERT: Gentlemen, I don't know anything about that. I have never had any experience with it. I don't believe that the absorption machines can burn much, but after a compression machine gets in a fire it will be almost ruined. I believe with the compression machine you should insure the full value of the machine. The condensers will be gone entirely. If a fire occurs they will be burned down. You will have nothing left of a compression machine of much value. In regard to the freezing tank, the covers will burn out and the insulation will go.

Mr. FRANK: Mr. Siebert, in our plant, the ammonia condensers set right on the ground floor.

Mr. SIEBERT: That is an exception. Most of the condensers stand above the floor. They stand on a wooden floor, and when a fire comes they sink down. The wall will collapse and you lose everything.

Mr. BELL: My insurance is $6,000, and if we had a fire, I don't see how the loss could be over half of that, and I think, if it goes into mutual insurance, the Association would soon have money in the treasury. We have paid within the last few years for insurance, several thousand dollars.

Mr. CORY: Mr. President, the secretary of our company is an insurance agent. He probably gets the best rate in existence, and attends to that strictly, and I do not know what the rate is.

Mr. VAN GORDER: It is getting close to dinner time, and perhaps it would be well to postpone the discussion on the cost of fuel in different localities until the Northern Association meets this afternoon, after the reading of any papers we may have.

President LEACH: I should think that would be a good plan.

Mr. FRANK: Mr. President, if that is all of the discussion, let us settle down to the regular routine business of the organization. The question of dues in our Indiana Association has always been left to each meeting to make an assessment of whatever is required. I move we take that matter up now, and make a motion that each member pay for the ensuing year $1 as dues.

President LEACH: I would like to hear from the secretary whether that would be enough or not.

Mr. EWARD: There are some that are behind on their dues for a couple of years, and there have been no collections made on this year's dues as yet, and we have in this state fifty-five artificial ice plants. We have been able to go along so far, and I don't see that we will be at any great expense this next year.

Mr. FRANK: I was considering the matter of the expense of this insurance committee. If they get together and make any investigation whatever that will be of any importance to this Association, they will necessarily have to go to a little expense, and I believe the Association ought to pay it. I think we ought to make up the amount in the Indiana Association. She is the one that has been robbed all along. For that reason we ought to have a little more money in the treasury.

Mr. VAN GORDER: I think there is a motion before the house that we make an assessment of $1. I offer an amendment, that we make it $2, and I think that will cover all the expense that will be incurred. I make that amendment to his motion. [Motion seconded by Mr. Rettig, and carried.]

President LEACH: I will appoint on the committee to investigate the matter of insurance, Mr. Louden, as chairman, Mr. Martin and Mr. Frank. They are all young and energetic. I hope they will give it prompt attention. It will do a great deal of good to the whole Association. Our insurance is reduced to 1½ per cent, and in comparison to what we have been paying before, it is quite a reduction, but I still think it should come down. I can see no reason for charging exorbitant rates on ice plants.

Mr. FRANK: Since our last meeting some of the companies who are members of this Association have reorganized and now do business under a different name. I suggest that as they have always taken an interest in our meetings from the very beginning, they be allowed to have their names corrected on the list of members.

President LEACH: That will be done by consent.

Mr. MARTIN: Wouldn't it be well for the secretary to read the names of the members now belonging to the Association? There may have been some new members since the last meeting, and we would like to learn who our brothers are.

The secretary then read the names of the members.

Mr. Frank then moved that the officers be elected. Motion carried.

President LEACH: The first on the programme, I believe, is the election of president for the ensuing year, and I want to express my thanks to the Association for the very great honor conferred on me in electing me twice to this very high position, and I want to decline in advance any re-nomination. First in order will be the nomination for president.

Mr. VAN GORDER: I nominate Mr. W. H. Martin. [Nomination seconded by Mr. Watts.]

Mr. LOUDEN: I move that the nominations be closed, and the election of Mr. Martin be made by acclamation. [The motion prevailed.]

Mr. MARTIN: Gentlemen, I can assure you this is an unexpected pleasure. I knew nothing of this. I appreciate the honor, however.

Mr. LEACH: The next, I believe, will be the election of vice-president.

Mr. FRANK: Mr. Chairman, I put in nomination Mr. Matthews, of Bloomington. [The nomination was seconded by Mr. Martin, and prevailed.]

Mr. MATTHEWS: *Mr. Chairman and Gentlemen of the Convention:* I thank you for the honor. It was entirely unexpected. The duties, I infer, will not be very great, so I will accept the office.

Mr. LEACH: The next in order will be nominations for secretary. Whom will you have for secretary?

Mr. MANNING: Mr. President, I nominate Mr. Eward for secretary.

Mr. WATTS: Mr. President, I nominate Mr. Johnson, of Anderson, for secretary.

Mr. EWARD: I would like to make a suggestion that the secretary be chosen from the town at which you are going to hold the next meeting.

Mr. WATTS: In accordance with this suggestion, I withdraw my nomination.

Mr. MANNING: I withdraw my nomination, also.

Mr. LOUDEN: I move you that we determine where the next meeting is to be held.

Mr. LEACH: We would like to have some town as good as Marion. We have been nicely entertained here, I am sure.

Mr. RETTIG: I suggest Kokomo.

Mr. FRANK: We have been to Alexandria twice, and I am not going to invite you to come there; but I will just say that Indianapolis is the best place to hold this meeting. You can get a larger attendance there. It is centrally located, and many go there on business often during the year anyway, and if we know that the meeting will be held there you may let the other business drag along until the time of the meeting. It is easy of access, and last year we had the largest meeting there. I believe the members will take that trip as an outing, and transact their other business when attending the meeting.

Mr. FRANK: I am in favor of Indianapolis, and make that as a motion. [The motion was seconded by Mr. Louden.]

The chairman then put the motion, which was to go to Indianapolis next year, and the motion carried.

Mr. EWARD: As Indianapolis has been chosen, I would like to place Mr. F. C. Johnson in nomination for secretary and treasurer. As he lives in Anderson, he can get there.

The nomination was seconded by Mr. Frank, and prevailed.

On motion a vote of thanks was extended to the Marion Ice and Cold Storage Co., the Indiana Brewing Association and the Commercial club for the hospitable manner in which they had entertained the members and for the entertainment provided for them.

Mr. MARTIN: I move that we tender a vote of thanks to the editors of ICE AND REFRIGERATION for attending this meeting and reporting the same. [The motion was seconded and carried.]

On motion the meeting then adjourned *sine die*, with the understanding that the members should meet in the afternoon at 2 o'clock with the Northern Ice Manufacturers' Association.

The Northern Ice Manufacturers' Association.

The second annual convention of the Northern Ice Manufacturers' Association was held at the Commercial club rooms, Marion, Ind., on Wednesday afternoon, March 14, 1800.

President Hagerty not being present, Secretary J. H. Frank called the meeting to order at 2 P. M., and called on Vice-President Barley to preside. Mr. Barley stated that he had retired from active interest in the ice manufacturing business, and would therefore suggest that Secretary Frank be elected chairman to preside at this meeting.

On account of the minutes of the previous meeting having been already published in the official organ, ICE AND REFRIGERATION, it was deemed unnecessary to read them, and there being no objection, the reading was dispensed with.

Mr. FRANK: *Gentlemen of the Northern Ice Manufacturers' Association:* This is something I did not expect, as we have four vice-presidents, and have only one here, and he is not qualified to serve; so I will have to ask that some one assist me with the secretary's duties, if I fill this position. I would ask Mr. Watts if he will serve in that capacity.

Mr. Watts then assumed the duties of secretary for this meeting.

Mr. FRANK: Gentlemen, I am not prepared to make any president's address this afternoon. I expected our president, Mr. Hagerty, from Columbus, Ohio, here, but as time is growing late, we will proceed to business. What is the wish of the convention? Is it the wish that we take up the subjects to be discussed that are in the programme, or has any one anything to offer or suggest? If not, we will have a general discussion on the "Best Method of Handling Hard Water in Boilers and Condensers." I would like to hear from any one who has experienced any trouble in this line.

Mr. HOWARD LEACH: *Mr. President and Gentlemen:* We have had some trouble with hard water, although after looking over the condensing coils in the Marion plant I don't think we have had as much trouble as they are having with their atmospheric condenser. The waters don't seem to be alike in this respect: The deposit we get on the pipes seems to be more porous and doesn't take on that hard scale. And I think, owing to that fact, we have had no trouble with atmospheric condensers of any kind, either for condensing or ammonia; but then we had trouble with the boilers liming up, and to get around that we put in Hoppes' feed water heater and purifier. Since then we have had no trouble at all. We used to get our feed through what is known as the weak liquor tank, and after it comes from the weak liquor tank we found we got a little red ice on account of the magnesia and iron in the water; so we took our feed water directly from the fresh water supply pipe, and in doing that we got rid of all red stuff. I believe that is all I have to say about that. We are having no trouble now.

Mr. SIEBERT: There is a system of using soda in settling tanks, for taking not only the mud but the hardness out of the water, and I have generally advised to let the water first go over the ammonia condenser and then over the steam condensers, to get a deposit of all such stuff on the pipes, and remove it from there instead of getting it out of the boilers. I know a live steam heater will take it out, but it does not always pay to do that.

There is a plant in Memphis, Tenn., in which there are two machines, a Ball machine and a De La Vergne. With the Ball machine we had trouble with the ice. With the De La Vergne machine we had none, and we found the difference simply in this: We took the feed water from the condenser, and the iron

was taken up by the water while ruuing over the hot gas pipes. I think first of all, the water should be boiled over as many coils as possible, and hot coils, too. That would take out iron and dirt. When you put water that contains mud over tubes that are exposed the scale will burn and crack, and when the water covers the tubes again it will wash it out. Therefore, I am in favor of taking the dirt out before it goes into the boiler. In the Mound City plant at St. Louis, before the water goes into the boiler it is always filtered.

Mr. VAN GORDER: I have overcome the trouble simply by the use of a hammer and the boiler makers. That is the way I overcome my trouble here. My engineer goes into the boilers every two weeks and takes out all the scales he can get out, and then about once every year we have to take the tubes out and replace them. When I say we have the worst water I except none. I don't think any plant in the state has as bad water as we have. I have had the water analyzed two or three times, and the chemists have told me they thought we had the worst water, this side of the alkali country, that they ever came across. We clean our boilers every week, one on Tuesday and the other on Friday. When we knock out the manheads we find the boiler is full of a thin watery slush up as far as the opening of the manhead in front, in one week's time. We clean them out as clean as we can. We have strong hose, and use as much pressure as we can put on our pump to wash them out—a pressure of 100 pounds, probably, to the inch. That would naturally wash everything loose. We scrape out every bit, and the boilers are kept as clean as they can be. I have a careful engineer, and I see that he takes pains to keep the boilers clean. On condensers, it is necessary to knock the scale off of them two or three times during the season. Our weak liquor coils are submerged. On those submerged coils a hard shell forms, but breaks loose once in a while. We have to clean those once every year—take them outside of the tank and clean them off thoroughly. All you have to do is to knock the scale off. A pipe will last longer if it is always covered than it will any other way. We don't have any trouble with our ammonia pipes in our condenser—about their breaking. They get covered with a formation of lime that protects them. When you wash them off wherever the water runs it is like new pipe. As long as that water runs over the pipe there is never a particle of rust on the pipe. They cover so quickly with the formation of lime that they do not have any time to rust at all. There is that much in favor of the water we have.

Mr. RETTIG: Do n't you have a live steam heater?

Mr. VAN GORDER: We have no heater except the heater and condenser combined. We run steam from the ejector through the tank, and the hot water is run through in the opposite direction. We transmit the water from one to the other.

Mr. LEACH: What is known as a generator exhaust?

Mr. VAN GORDER: Yes. We take our feed water tank down every year. We took it down this last winter, and there was n't an opening larger than a lead pencil through that pipe. It was filled up with lime. It is so hard you can't pound it out. You can break it apart, but the stuff is still there, and you can't take it out; you can't burn it out. It is between the boiler feed pump and the boiler.

LORANZO D. HAGERTY, COLUMBUS, OHIO.
Retiring President Northern Ice Manufacturers' Ass'n

WM. M. WOODROW, CHILLICOTHE, OHIO.
President Northern Ice Manufacturers' Ass'n.

J. L. FRANK, ALEXANDRIA, IND.
Sec'y and Treas. Northern Ice Manufacturers' Ass'n.

Mr. FRANK: You take it down once a year?

Mr. VAN GORDER: Yes, and throw it away. The water is probably at an average temperature of, say, 60° or 65°, not over 70° at the outside. The water supplies the boiler feed pumps. I took out that pipe this winter, and it is just as full of that formation as can be, so full we didn't get water enough for the boiler feed pump through a 2-inch pipe. We had to take it out and throw it away. That is cold water. Let this water run over a barrel or tank, and in a month or two it has formed a coating on there, and in a few months it is several inches thick. I have tried compounds several times without any beneficial results. I use at present soda ash, the same as is used by the gas men around, a small quantity at the suction lines of the boiler. I think it is good. It keeps the lime in solution in the water. You don't get so heavy a crust, and it keeps peeling off all the time.

You gentlemen can see that our ice is clear. We make as clear ice as it is possible to make. There is no dirt or discoloration in it. I presume if you use too much of the compound you possibly will get a trace of it. Slightly changing the subject, the color of ice is not always produced by anything that comes over from the boiler except in the shape of gas. A good many people have an idea that the red in ice is caused by some solid substance. In the majority of cases it is not that at all. You can put as many charcoal filters and rock filters and sponge filters as you like back of a machine; when it gets in that condition I will guarantee you will have red in the ice just the same. The red will go any place the water will. When it comes over from the condenser it comes as a gas, and until it is condensed or becomes cold, you can separate it from the water by having an exhaust. Take it in my machine there, if I have a free exhaust from the upper part of my condenser tank I never have a bit of red ice, but I can run that machine so I don't have any exhaust, and I will have red ice every time. When we allow the exhaust to escape we don't have any trouble about red ice. I look up at the steam pipes on top of the condenser and see that they are not working, then I know we will have red ice. Whenever I see a reasonable amount of steam coming out there I know the ice is all right.

Mr. Leach: That steam is going out of what is called the cooler?

Mr. Van Gorder: Going out of the hot water tank.

Mr. Frank: Can you tell why, when you have plenty of exhaust, you have no red in the ice? What is the reason of it?

Mr. Van Gorder: Because this gas goes away with the exhaust. It won't condense with the water. But whenever you run your water too hot or too cold that is what makes it. It is so cold that it condenses with the water. I don't know what the nature of this gas is, but I am satisfied when it is too cold, or your condenser gets so full of water that you blow the steam into the water, it becomes liquid and goes away with the water. The water will look as clear as any water you ever saw, but at the same time it will make red ice every time.

Mr. Frank: Well, gentlemen, I believe that I have had more trouble with red ice, and had to work under more difficult circumstances than any of you. Mr. Van Gorder says he has the hardest water, telling about his pipe liming shut in one year. Mine lime solid every thirty days. I have two boilers fed by pumps—must have them, one by the side of the other. I have only one line to my boilers, but have them both connected with the heater. Every two weeks I have to take cold chisels and cut the lime out of the pumps. I have two lines into my boiler and once a month that pipe is taken down, and you can't run a lead pencil through it. I don't have time to reclean it and refit it, but have another one all ready, and just take it down and fit the other in, and let it go again.

I had a queer experience in getting red ice. I quit manufacturing ice awhile ago, and went to manufacturing red paint. I got my whole system so full of it that it ran out like thick red paint. Four years ago I threw out the steam condenser that was furnished with my machine. The water was so hard it would lime the tubes entirely full in sixty days, and control it you could not—it was just the same as drilling out steel. Two men could not bore it out with pipe wrenches and two or three holding and pressing on to it. I had to abandon that kind of steam condenser, and make an atmospheric condenser. The lime would form on those coils an inch thick in ten days. I bought a tower thirty feet high, and put my coils up on there, making an atmospheric condenser of my own, ran a 5-inch exhaust line up there, put a header or manifold on the end, put eight coils of seven pipes each up there, and ran water over them, and a 1¼-inch header overhead, and ran to my reboilers by gravitation. The less you handle distilled water with pumps the less air you get into it. It worked very well, however. I had a cross in my 4-inch header, 5-inch exhaust line going up, and relief valve on the 5-inch line above. I just made a perfect cross. I made the nicest kind of ice for a couple of years, but I saw I was doing three times the work to pump the cold water up there. After I had let the water run out over the steam condenser by gravity, I did not have half the work to do. I went to work and lowered that, and, at the same time I was making those repairs, I made a little repair on the engine, so that it didn't take quite so much steam, and I could run at a lower pressure. I moved my condenser and put it back as it was, only taking out some of the exhaust line. I couldn't make a pound of clear ice to save my life, and I tried every scheme. It was as red as red could be. I couldn't understand why this moving of twenty feet from above to down below would make this difference. And so I went to analyzing this water as it passed through these condensers. I thought that the water was taking up the iron. And I noticed the overflow on the top of the reboiler, and just as it came out of the condenser. There I finally found it, but had to boil the water over again. I went to work and found that in making this change I wasn't putting as much steam into that condenser as I did before, and by pumping the water up there I don't think I was putting quite as much cold water over it as I did before, and I found my lower coils were not as hot as they were before, that the water cooled them off cooler, and that my water came over and went to the reboiler cooler than it did before. The idea came to me that I must heat those coils. In my paper I said the coil should be kept at a certain temperature all the time. There is where you get your red ice, by letting the lower pipes remain cold and the upper ones hot. The lower pipes throw off the oxide of iron when cold. I went to work and in two hours' time put a larger header on the other end of my condenser and my exhaust valve, and forced every bit of the exhaust steam through these coils. Instead of sending through whatever it would condense at this end I made it go out on the other end. I never had any trouble since. That is it exactly, as Mr. Van Gorder says, if you have enough steam and can keep those coils all hot equally, and a good exhaust, you have no red, but just the instant you slack up and don't put enough steam in there to keep those coils the same temperature, you get your red. I can make clear ice now. I finally worked my way.

Mr. Van Gorder: I would like to add another word to the clear ice question. Red ice is caused sometimes by running your boilers too full of water. That is a habit of the engineer, to think that he has got to carry from two and one-half to three gauges of water. An engineer ought to know just exactly how much water he carries; and if he carries four or five inches that is plenty at any time on top of the flues, under ordinary circumstances. If you get it up too high it is going to run over and carry over some of that lime and stuff, and that will go through your condensers and will make a little bad ice; but that is the fault of the engineer, and if he does n't know that it is your business to see that he does know it. The red ice is not always the fault of the engineer. He does not know the conditions about the steam, and does not watch that as closely as you do. We carry from eighty to eighty-five pounds pressure. Our boilers blow off at eighty-five.

Mr. Rettig: We carry ninety to ninety-five. Our boilers blow off at 105. We find that it is a big help to us, and that it makes clearer ice, and that we are not troubled with red. That carries the red off. As soon as the blow-off stops we find we have more or less red.

Mr. Siebert: I wanted to ask Mr. Frank whether he had as bad an experience with hard water as I had in Cincinnati. I could n't keep my sewer pipes going. I had an 8-inch pipe down to a 12-inch sewer, and had to have a man with a shovel every three hours to shovel it out. We had half city water and half well water. The well water furnished the lime and the city water the dirt.

Mr Frank: If I had a 36-inch sewer away from my plant with a fall of one foot to twelve I would lime it shut in four months. I have a ditch leading from my plant that is three feet wide and a foot deep, and at least every thirty days I have to dig out that ditch, which will be full of lime and stuff that goes from my plant. I could n't any more use a closed sewer than I could an inch gas pipe to carry the water away. Every thirty days I will take off on an average a yard of lime from my steam condenser, and we use every means to catch the lime before its gets to our boilers. We run water over the coils and steam condensers inside, and steam condenser and exhaust steam heater, and then we boil it again. I think we heat it seven or eight times, and still after it leaves there and runs through an open ditch three feet wide and a foot deep, in a month or two months' time that ditch will lime entirely full, until it overflows on the ground.

Mr. Leach: We have been using a 6-inch vitrified closed drain for five years for escaping water.

Mr. Frank: I would just say further that I have experimented, I expect, more than any one in this neighborhood, with boiler compounds and anything to get rid of lime. I used to buy soda ash by the wagon load, and have got about half a wagon load now on hand, because I have quit using it. I have found something better. Every one of the agents says he will put a barrel in on trial, and if it does n't do the work it won't cost anything. I think I have had twenty-five barrels of compound under those conditions. The first thing that ever did me any good was soda ash, dissolved and pumped into my boilers; but the best thing I have ever found—and I am not here advertising anybody's goods, but it is what I am using now—is a boiler compound made in Cincinnati called "The Banner Scale Solvent." It leaves the formation just as Mr. Van Gorder said, in a soft, mushy condition in the boiler. When I take out a manhead, there will be four inches of soft substance. If I did n't use that solvent, there would be nothing there, it would be all on the tubes and on the shell. I take out my tubes now every twelve to eighteen months.

Mr. Manning: We have very serious doubts about compounds. I would like to hear about them.

Mr. Watts: I have quite a good deal of lime and magnesia to contend with in the water. I use the "Banner Scale Solvent," and I believe I get good results from it. I believe if I would do away with that solvent I would have to replace those tubes every year. I have only one boiler in my plant, and when I shut down I put probably half a gallon of the compound in the condenser and let it stand. I have noticed that there seems to be quite a good deal of lime and magnesia taken off the pipes. When those tubes do lime up, my cheapest way is to get the machine man to cut them out and put new ones in. Mr. Martin claims he can cut the lime out cheaper. I cannot. I found that I expanded the tubes and had to plug them up, and finally had them all plugged.

Mr. Frank: Relative to the "Cost of Gas, Coal and Oil in the Manufacture of Ice," I think Mr. Manning was given that subject.

Mr. Van Gorder: Have we any gentlemen here who burn coal? I would like to hear from them. We would like to know what we will have to meet after awhile.

Mr. Louden: Gentlemen, I don't think we in Bloomington could give you any information that would be at all pleasing or pleasant to anticipate for the members of the gas belt. We pay from $2 to $2.25 per ton for coal, pine rock, bituminous, Green county, Indiana coal, and with that ton of coal we make about a ton of ice and sometimes a little bit more.

Mr. Frank: Does one ton of coal make only one ton of ice?

Mr. Louden: It is just a small fraction over a ton of ice. Our plant is rated as a 10-ton plant. It is a slide valve engine and necessarily very expensive. I do not think that our plant would be a fair test of what the people should expect. Ours is an exception over the left shoulder.

Mr. Martin: Mr. President and gentlemen, in the gas belt as long as you can get gas, hang on to it. The gas company at our place started us in at $75 a month. They next cracked it up to $100. Last year we paid $150. We are glad to get it at $150. We have a 10-ton machine and pull twelve tons of ice off of it. We get our coal at $1.35, delivered on the track there. We bought nut and slack mixed for $1 a ton last year, and have bought it as low as eighty-five and ninety cents. I would prefer good nut and slack to mine run. The engineer will take the mine run coal and will not break it up fine enough, but pitch it in the furnace in lumps. Those lumps will ignite, but they don't burn quick enough to get the heat. The next thing he has got to do is to stir his fire. The mine run coal is just as it comes from the mine, with plenty

of dirt in it. When he pitches in a shovel full of coal the dirt will sift down on your grate bar, and there it will be in clinkers. With a good close grate bar the nut and slack we consider the best coal. Of course, with an open grate bar I don't believe it would be, because you would lose considerable of the slack through your open grate bar. We have to start up in the spring with coal until it gets warm enough for the gas company to supply us with gas. We got gas last year through June, July, August and September, used coal before that time and afterward, and we tried both mine run and nut and slack. The coal makes a nice fire, but there is no economy in its use. As long as you can get gas, hold on to it.

Mr. Van Gorder: About how much coal do you figure in your plant for a ton of ice? How much does it take to run your plant a day of twenty-four hours?

Mr. Martin: We run from four and one-half to five tons. Of course there is considerable in your fireman. The man that scatters his coal is the fireman that you want. You want the man that keeps busy all the time. You don't want the man to open up the furnace door and pitch in three or four shovels and sit down. You want the man that fills his shovel, opens the door, throws the coal in with a quick motion, and spreads it over the fire, and then it ignites the moment it strikes the fire. If you bank in a lot of coal at one time, a large per cent of it is lost. There is a good deal in the fireman, in considering the coal question, and if we have a man who shovels in four or five shovelsful at one time, and goes and sits down, he he gets a talking to.

Mr. Rettig: We have had some experience with coal and gas, and during the summer season we burn gas at the rate of eight cents. We find it cheaper than coal. Our coal costs us a little more money, and we burn a better coal. We burn a domestic lump and by handling our fires right can get better results than we can with the nut and slack; and the temperature at which you put your water into your boilers makes a big difference. Our gas runs from $160 to $190 a month. Our coal costs us more than that, and we tried the nut and slack and mine run, but we find that we can get better results with domestic lump, the best coal we can get. We find we can get more heat and more condensed water. We have a 15-ton machine.

Mr. Martin: What kind of nut and slack did you use?

Mr. Rettig: Jackson, Ohio, coal.

Mr. Manning: How many tons of ice can you make with a ton of coal?

Mr. Rettig: In the month of August our bill was $180, and we averaged fifteen tons a day. We did not run short of our capacity, but ran over all the season. Four hundred and fifty tons cost $180. That month we just made our capacity right along, and I took my tank reports just before I came down here and examined the fuel bill.

Mr. Johnson: That would be forty cents a ton. What would it be with coal?

Mr. Rettig: We have never run regularly when burning coal. It makes quite a difference in starting up, and so on. It would cost us considerably more money.

Mr. Watts: *Mr. President and Gentlemen:* I take gas at the rate of $40 a month. At first I paid $25, but the electric light people were getting the same rate that I was, and finally I was told that it wouldn't be fair to charge them the same rate that I was paying, as they only ran from 4 o'clock in the evening until 12, about. At $40 per month I figured that my fuel per ton costs me about twenty-seven cents, or $1.33 a day. That includes lights and all. I have six or seven jets. If I burn coal—and I did burn nut and slack in the early part of the season, starting up in February, and the Jackson nut and slack cost me $1.60, and I will burn about three tons of that in twenty-four hours and make five tons of ice—I figure that that costs me $1 a ton for fuel.

Mr. Martin: In burning coal I would advise every one to be very careful about selecting it. If you have to come to coal when it comes from the Indiana fields, you should be careful. We got a car of coal last fall, right at the time that it was so hard to get cars in. The railroads were short of cars, and we would order coal two weeks ahead, and sometimes we would be short for two days before we could get the coal in. One time when we went out to look at a car of coal there were blocks of iron in it that would do to make a corner of a house. Some of them would weigh as high as 150 pounds, and it was put in for lump coal. What would you do with it if you would get that kind of a car? Of course, we refused the car after we looked it over. I was advised to buy bituminous coal instead of the lump coal for purposes of steam. I have used some block slack, and it doesn't give very good results. I used some of it in a pressed brick plant we had there at Crawfordsville, and did not get near the satisfaction out of it that we got out of the nut and slack. We tried some peat coal. That is a little too fine. The best that we got was a bituminous nut and slack.

Mr. Frank: Has any one here had any experience with oil? We have plenty of oil and gas, both. I have never tried the oil yet. The price of oil at the present time would make it advisable to sell the oil and buy coal.

Mr. Bell: I have had some experience with coal. Last summer we had block coal, and double slack, and we bought what is called Pittsburg coal and New River coal from West Virginia. We found that New River coal all burned up and left no ashes. Before we had our engine fixed we weighed the coal and burned two and one-half tons in twelve hours, and kept an engineer shoveling coal. Since we got our engine fixed we burn now in twelve hours a little over one and one-half tons. I think one day we burned 3,500 pounds of coal. We shut it off at night, and don't use quite so much, so we burn about one and one-half tons of coal for six tons of ice. By fixing the engine we cut off nearly a ton of coal in twelve hours. I have a car of very bad coal on hand, and when we run twelve hours we have four, five and six wheelbarrow loads of ashes to haul out every morning; and when we bought our West Virginia coal or nut and slack, we would clean out once a day or every other day, and we counted on from one to two wheelbarrow loads of ashes from that West Virginia coal. It all burned out. In this other coal we find dirt and ashes and stones and little pebbles, which, if you pour water

on them, are like pieces of mud—only dirt. This West Virginia coal has none of that. We paid for that West Virginia coal last fall $1.80, and now we have to pay $2.20. I would rather pay the $2.20 than to pay $1.50 for the Pittsburg coal. That is the difference in coal from the different mines.

Mr. FRANK: The next subject will be, "Plate Ice Methods, and Cost of Manufacturing." Can any one give us any information with regard to the cost of that ice relative to can ice? I don't think there is any one here who has ever had a plant of that kind.

Mr. SIEBERT: In New Orleans they had a plate ice machine, and ran it for a couple of years. At one time they sent to the company I was with to examine the plant, so I was about thirty days in that plant. I know by experience the plate ice plant costs about 50 per cent more than the can ice plant. It takes about twelve days to freeze the plate. There is no doubt that the plate plant is the plant where there is water power, but whenever it comes to a place where you have to use steam, I would not advise, under any circumstances, the use of a plate plant. First of all, you have to leave between the two plates a great space for the dirty water to accumulate. That water of course you can exchange for fresh water, but anyhow it is a cumbersome affair. This plant had ammonia coils inclosed in wrought iron plates. I don't believe there is much saved because we can always get steam enough, and I don't believe there is any advantage except where there is water power.

Mr. FRANK: The next is, "Report of Natural Ice Crop." I believe we had a sufficient amount of that this morning. We will pass that subject. The next is, "How to Meet the Competition of Natural Ice." Has any one anything to offer on that subject?

Mr. MANNING: This is quite an important question with some of us, and different in different cases. It depends upon the surrounding circumstances. There is one remedy I think that I can give to meet the competition, and that is for all parties to exercise good sound common business sense. We have all learned that the profit in an ice factory depends largely on prices, and it is possible to put the price down to a point where there is no profit in it. Now, I have noticed in some places that some people get a little hot headed and go to fighting. I have found in nearly all those cases that they did not gain anything, but rather lost. I found in other places where people got together and exercised a little common sense and avoided the competition they got along better.

Now, in the first place, every town that wishes to protect its trade must have sufficient machine capacity to do it, or else they must expect competition in the way of natural ice. They have got to have the ice in some way They must provide the town with ice. We have never had much competition in our town, except the first year, and we were a little hot headed and we lost a great deal of money, but I succeeded in whipping the other fellow, so that I got that satisfaction at a good deal of expense. But it seems to me the proper way to do is to try to control the ice trade by buying the output of the man who proposes to ship in the natural ice; and if you can't do that, I don't know how you can meet the competition. They will manage in some way to dispose of their ice.

There is another class of men, those who have both machine ice and natural ice. We have a way perhaps of bringing them to terms, by shipping ice into their territory if they ship into ours; but I think the better way is to see those parties and come to a reasonable understanding with them.

After a discussion on the relative position of the machine and natural ice men a committee was appointed, consisting of Mr. Manning, Mr. Rettig and Mr. Frank, to investigate the matter and report to the members of the Association.

Mr. FRANK: We will now hear from Mr. Albert Siebert. Mr. Siebert is here upon the invitation of the secretary of your Association, and I will ask that he be given the best of attention. [Applause.]

Mr. Siebert, of St. Louis, then read the following paper:

ECONOMY IN SMALL ICE PLANTS.

It is the general impression among ice manufacturers, and even among ice machine manufacturers, that no economy in fuel is possible in a small ice plant over a single-cylinder Corliss engine. While it is not possible to get the same economy in fuel in a 10-ton plant as in a 100-ton plant, yet enough fuel can be saved by introducing coal saving devices to make the investment pay for itself in one or two years—which is really the criterion of any investment. Small compressors and small engines have, as is well known, more friction than larger ones, as their parts have to be made comparatively larger.

Considering the engine alone, the steam cylinder condensation will also be relatively greater in small engines, as the surface of the cylinder walls bears a higher ratio to the cylinder area, consequently offering more surface to the steam to give heat to. It is known that large simple Corliss engines, exhausting at atmospheric pressure, require thirty pounds of steam per horse power per hour, while small ones working under the same conditions require forty pounds. A great deal of this waste of heat can, however, be saved by providing a live steam jacket.

The best possible result obtainable in a large compound condensing engine, working with 125 pounds pressure and 24-inch vacuum, is fifteen pounds of steam per horse power per hour, or a saving of 50 per cent of fuel against a simple Corliss engine. A small engine, compound condensing, working with the same pressures as above, will require twenty pounds of steam or will save also 50 per cent of fuel in comparison with a plain Corliss engine of same size. While it is, therefore, not possible to work a small engine as economically as a large one, still the saving in both cases, when making the same compound condensing, is the same, viz., 50 per cent.

Making the engine condensing without compounding, which can be done generally without great expense, effects a saving of 25 per cent to 30 per cent in fuel, and reduces the steam required per horse power per hour from forty pounds to twenty-eight pounds.

Of course the item of labor to handle the machinery is much in favor of a large machine; the same engineers and firemen are required within a wide range of capacity of the plant. But I believe that in a small plant, producing 400-pound ice blocks, which can be handled quite easily with a geared hoist by one man, the firemen can do the pulling, thus saving the two ice pullers otherwise required. The firing in a small plant is easy work for the fireman, and, should the man have to go to the vault, the engineer can certainly take charge of the boiler in the meanwhile. It is of course necessary in this case that freezing tanks and boiler be located close together, and have a handy communicating door.

In a 10-ton plant there will be fifty cakes to pull per twenty-four hours, or about two per hour, while a man can pull eight an hour, if he has nothing else to do. It is therefore no great work for the fireman to do this, and he can leave his boiler for about eight minutes at a time, since this is the time that will be required to pull, dump and refill a can.

This question, however, has nothing to do with the fuel economy; I have only mentioned it because it affects the general economy of a plant; besides, it is very easy to split a 400-pound block into two 200-pound blocks, as experience has shown, and the two blocks look much prettier, showing considerably less core than the 400-pound block. It can hardly be expected from a fireman to pull four 200-pound blocks per hour, and still attend to his boiler properly. Besides, such plant will be much cheaper in first cost, and the freezing tank will require only one-half the space; it is evident that if cans and tank are made only higher, it will not cost as much as if twice the number of cans and a tank of double the area had to be furnished. The coal consumption can further be reduced by arranging the plant properly, and keeping condensers and coolers clean.

To illustrate what clean condensers mean, we assume that

with plenty of water and clean condensers the condensing pressure is 153 pounds. Now the pressure rises on account of scarcity of water or dirty condensers; and when the pressure rises to 168 pounds, then the coal consumption will be increased 7 per cent, and the capacity of the machine decreased 1 per cent. Again, when the pressure rises to 183 pounds, the coal consumption will be increased 13 per cent and the capacity be reduced 3 per cent. And finally, to go to the extreme, when the pressure is gone up to 217 pounds the coal consumption will be increased 26 per cent and the capacity of the machine for making ice reduced 6 per cent.

The next question is to have the proper temperature for the boiler feed water and condensed water, either when entering the reboiler or when entering the storage tank. To ascertain what a deficiency in this direction means, take the temperatures of both as I have found them frequently, viz.: 140° and 150°, respectively, while their temperatures should have been at least 205°. I shall now express in tons of coal the loss incurred by the above waste in a 10-ton ice plant.

A 10-ton ice plant requires, if care is used, eleven tons of condensed water, one ton being allowed for drip on steam condenser, for skimming of reboiler and for melting out the ice. We require therefore eleven tons of exhaust, or if not so much is on hand, we must make up the deficiency by live steam. If the condensed water enters the reboiler at 150° instead of 205°, it must be heated by the live steam coil in reboiler to 205°, which would not have been necessary, if it had been admitted at the proper temperature; or, a loss is found of 205—150=55°.

The feed water enters the boiler at 140°, while it should have been also 205°; therefore a loss of 205°—140°=65°; or a total for both of 120°. These 120° represent 120 thermal units, or are equivalent to the heating of 120 pounds of water one degree. The evaporating of one pound of steam at 125 pounds pressure requires 1,189—205=984 thermal units; therefore the loss expressed in pounds of steam = (120+984) ×11=1.34 tons. Assuming that one pound of coal will evaporate six pounds of water, and that one ton of coal costs $1.25, we find the waste equals .22 ton of coal or about three cents per ton of ice.

The next question is to get the condensed water as cold as possible into the cans, since ice made of cold water will be prettier and will remove a great deal of work from the freezing coils, even if it does not reduce the freezing time materially. This can be done by the condensed water cooler, in the first instance, by water available and down to its temperature, but this forms a part of the system to bring the temperature of the condensed water to 205°, and will be discussed later.

The next thing is to cool the condensed water to about 34° with ammonia, but this also will be discussed later in connection with the heating of the condensed water.

We come now to the heating of the condensed water to 205° before entering the reboiler. This must be done by proper construction and proper handling of the steam condenser. The steam condenser should be built in sections, and each section separately drained, so that the steam, as soon as condensed, will be drained off and not be reduced to a temperature below 205°. The water supply for condensing purposes must also be regulated so as to obtain the above result, and this is only possible if the right amount of condensing surface is provided.

Now to get the feed water at a temperature of 205°, or as hot as it can possibly be made, provide two separate open air condensed water coolers and erect same in an iron pan, measuring about five or six feet by twelve inches high, with one partition in center, also twelve inches high, separating the pan into two water tight compartments, and provide one outlet for each. Each cooler should have about 100 feet of 2-inch pipe for a 10-ton plant. The water coming from the reboiler to be fed in at the top of the first cooler, leaving it at the bottom, entering then the second cooler at the top, and leaving it again at the bottom, and from there passing into the storage tank.

The water which is showered over the first cooler is preferably water which has first passed over the ammonia condensers, then over the steam condensers, which proceeding gives the water a chance to get rid of mud, and especially iron, by oxidizing and depositing it on the pipes. This water will most likely have a temperature of 140°. In this supply pipe place a Mason regulating valve operated by a flat float, placed in the first compartment of the pan, keeping the level in the compartment constant by regulating the flow accordingly. The suction of the boiler feed pump is now connected to the outlet of the first compartment, and therefore only just as much water as is needed for boiler feed can run over the first cooler; and since this quantity is exactly the same as the condensed water passing through the inside of the first cooler, a perfect heat exchange will be effected, provided the cooler is of sufficient size. The condensed water leaving the reboiler has a temperature of 212°, and if the cooler is large enough, the feed water should be not only 205°, but 210°. The condensed water leaves this second cooler at about 147°, and is now to be cooled by the coldest water at disposal, and all the water possible should be used on the second cooler, to get the temperature of the condensed water down as far as possible, and to save coal by saving this work on the ammonia cooler.

The boiler pump should work continually, so as to get a steady flow of water over the first condenser; such a thing is to be recommended under all circumstances, as it preserves the boiler and saves coal, besides preventing irregularities in the steam pressure.

(3)

To cool the water down further, an ammonia cooler must be used, combined with a condensed water cooler, so as not to expose the condensed water to the atmosphere. Such a cooler consists of two sections of pipe, the upper an ammonia section and the lower for condensed water. Same is mounted in a tank about three to four feet wide and four feet high, the cooler to be set so that not more than two or three pipes are under water.

Ammonia is expanded in the upper cooler at the top, and cools a certain quantity of sweet water, which is pumped over and over the whole cooler continually. This water, when it reaches the condensed water section, will in turn cool the condensed water running through it, and then go over the same course again. Such tank and cooler must be placed either in a cold room or the whole thing must be well insulated. A cheap rotary pump is all that is required for the circulation of this sweet water.

Such a cooler will bring the water to 34°, and requires only ten feet of 2-inch pipe and fifteen feet of 2-inch pipe for the ammonia and water sections, respectively. The advantages of such a cooler over a coil placed in the storage tank are many; there will be no waste of refrigeration, when no ice is pulled, since the rotary pump will still work and make the circulating sweet water colder and colder, and finally freezing part of it, and the minute the ice is again pulled, the ice will melt and the stored refrigeration will be fully utilized, and further the water is not exposed to the atmospheric air, and can therefore not take up any air. The storage tank in this case should have a well fitting flat float, with tell tale attached, first to prevent the air from coming in contact with the water and, second, to tell the ice puller how much condensed water, he has at all times.

The float should act also as a valve, shutting off the connection from the storage tank to cans when the water stands too low, so as to prevent air from entering into the pipes and filling device. The float should also be attached to a Mason regulating valve placed in the pipe, leading the water from the reboiler into the storage tank, so that the storage tank will not overflow; and when there is a surplus of water the reboiler will skim lively, which is a great help for getting rid of the oil.

Another great item in economy is to work with the proper suction pressure. A well proportioned ice plant having 11×22-inch ice cans, fifty-six inches high, producing 400-pound blocks, should have a freezing time of sixty-six hours, work with twenty-seven pounds suction pressure, and have a brine temperature of 18°.

When there is no full sale for the capacity of the plant, let the temperature of the brine go up, by slacking the speed of the machine; then the suction pressure will go up, and the coal consumption will be reduced much more than the proportional reduction in the quantity of ice made; in other words, the amount of fuel used per ton of ice will be materially lessened.

To illustrate again this fact, we assume that you have worked with twenty-seven pounds suction pressure, and now, by reducing the speed you have increased the suction pressure to thirty-two pounds; then you will spend 2 per cent more coal per revolution, but get 12 per cent more ice per revolution of the machine; or, going further, if you have increased the suction pressure to thirty-seven pounds, then the coal consumption will also be only 2 per cent higher than at twenty-seven pounds, but you make 24 per cent more ice per revolution.

On the other hand, if you want to force the plant by reducing the temperature of the brine you must speed up your machine, decrease your suction pressure, and you will then make less ice and use more coal per revolution. If you reduced the suction pressure to twenty-two pounds you decreased the coal consumption 4 per cent per revolution, but you have to make 12 per cent more revolutions to make up for the decreased suction pressure; and if you want to make 10 per cent more ice you must, on top of the 12 per cent, increase the number of revolutions 10 per cent, or a total of 23 per cent. If, finally, you are forced to work with twelve pounds, the coal consumption will then be increased 8 per cent per revolution, and you make 37 per cent less ice.

If a new plant is to be erected, the following considerations should prevail: Consider first, that if you use compound condensing engines, you will still need eleven tons of condensed water and that your machine will furnish you only 20×30×24 ÷2,000=7 tons. Figuring that the dynamo, the agitator and pumps will furnish about one-half ton more, you have a total of seven and one-half tons, and lack three and one-half tons which you must get from some other source, viz.: Cold storage (in this case the ice machine must be of twenty-five tons ice making capacity), electric light plant, mill, or finally an evaporator. It is always best to combine the first three plants with an ice plant if possible, except when there is demand for distilled water, either for carbonated water or for Hygeia water for ordinary drinking purposes; then it might pay just as well as the before mentioned combinations. Of course, it is understood that the engines in the case of the electric light plant and mill are both compound condensing, and discharge their exhaust into the same steam condenser. It will also pay in such cases to use belted pumps and take the power for all auxiliary machines either from the power engine or the ice machine. You will readily see the advantage: First, the

pumps will discharge a full stroke every time; second, there will be much fewer repairs, and, finally, the amount of steam used will be materially less. An ordinary steam pump will use about 120 pounds of steam per horse power per hour, while you get a horse power from your compound condensing engine for twenty pounds; adding for friction 25 per cent, the total expense per horse power will be twenty-five pounds against 120 pounds. Three and one-half tons of extra exhaust, or 300 pounds per hour, are required. At the rate of twenty pounds per horse power per hour, you can run a 15-horse power engine without furnishing more steam than is needed to make the ice. You have therefore all that the 15-horse power can do, free of charge. One horse power will furnish about fifteen incandescent lights, and one ton of refrigeration requires about one and one-half horse power; therefore you can supply, without cost for fuel, 225 lights or 10×5,000=50,000 cubic feet, average cold storage. If you cannot get extra exhaust, you must use an evaporator. You need, of course, only one for three and one half tons, which would somewhat reduce the first cost; but on the other hand you would not get as warm condensed water, as you mix, in this case, three and one-half tons of the second condensation with only about seven and one-half tons of the first condensation, and the resulting temperature would only be 200° instead of 228°, as will be seen later. Such evaporator will cost about 25 per cent more than a steam condenser of same capacity, and the size and heating surface must be determined for each case separately, as it depends on the working pressure required in engine, and the boiler pressure.

The pressures I should recommend as best, for the present, are 175 pounds boiler pressure and 125 pounds pressure in evaporator, as the builders do not like to go higher at present.

The process of re-evaporation is based on the following facts: It takes little more heat to evaporate one pound of steam at 125 pounds than it takes to evaporate one pound at 175 pounds pressure; the difference amounts to about 1 per cent, but including the loss occasioned by the flue gases leaving the boiler at somewhat higher temperature, makes the total loss about 3 per cent. We therefore can get about seven tons of condensed water at the expense of 3 per cent additional fuel, and we have three and one-half tons of it to sell. The steam from the boilers enters the shell tube of the re-evaporator, which is built like a heater, and its temperature is at 175 pounds 378°. Such steam can of course heat water to 352° and produce steam at this temperature, which corresponds to a pressure of 125 pounds. But while giving off heat to the water contained in the shell, which water surrounds the tubes, the first steam will be condensed and forced by its own pressure into the reboiler. The steam produced by this condensation collects in the shell and is fed to the steam engine, but it is obvious that since we never obtain a perfect heat exchange in practice, we have to be satisfied to get only 90 per cent of the steam which we would theoretically have. We figure therefore that we have to furnish 8.2 tons of steam when we want to get 7.5 tons for the engine, but we get then 8.2+7.5=15.7 tons condensed water, while we need only eleven or we have a surplus of 3.4 tons. Of course this is only when we want to get as much as possible out of the re-evaporator. If we are satisfied with, say, about two tons of extra condensed water, we need to furnish only 7.5 tons of steam from the boiler, but we must then send part of the steam from the boiler into the steam outlet of the re-evaporator, producing steam there at a higher pressure. We get also a higher pressure in shell as we mix in this case, 1.5 tons high pressure steam with 5.5 tons produced there, having sent 5.5 tons direct, and can therefore do the work in the engine with seven tons less steam. These seven tons of steam, after having gone through the engine, are then discharged into the steam condenser, and there condensed at a temperature of about 140°, and pumped by a small pump into the reboiler. The condensed water therefore, as delivered to the reboiler, will have a temperature of 100°+140×90×3,525° +190=240°. This is 28° higher than the water can exist at atmospheric pressure, so these 28° will do all the reboiling needed. Now the extra expense for such a plant is not so great. There is required, besides making the engine compound, a vacuum pump (a steam condenser of same size every plant must have, anyhow) and the re-evaporator, but this is partly offset by the smaller boiler capacity required, in this case about one-third.

I believe that the cost of such improvement will be about 5 per cent of the whole investment, which I think will be about $10,000 for machinery and building; therefore the cost would be $500, and the saving, if we are satisfied with only two tons of extra condensed water, would be 3.5+6=.58 tons per day; and figuring eight months' work per year we would have a saving of .58×1.25×8×30=$174; and calculating that we get only $1 per ton for our condensed water, we have $1×8×30×2=$480, so that if we even realize only one-half for the condensed water the investment will have paid for itself in one year.

We have considered before all the economies which can be had without making any changes in the plant. We can, however, without much expense, get greater economy if conditions are favorable.

I would not advise doing anything with a 10-ton ice plant where there is only just sufficient condensed water and no waste. It would not pay. But if there is a waste, and this amounts to nearly 25 per cent of the amount of condensed water produced, then this 25 per cent of condensed water, and of course 25 per cent of fuel, can be saved, by providing a vacuum pump—that is, if the steam condenser will stand a vacuum. The cost of such pump is small, and the connections few. The vacuum pump can be made to discharge the condensed water into the reboiler.

Should the engine be a slide valve engine, about 50 per cent of the fuel can be saved, provided the clearance in the steam chest is small, or can be made so. A cut-off governor, when there is no more clearance below it than in the valves and ports of a Corliss engine, will give the same economy as a Corliss engine, cutting off just as sharp.

If the freezing coils are insufficient, while the can capacity is all right, an extra open air brine cooler can be provided, which requires only about twenty feet of 2-inch pipe per ton. The brine can be pumped by a rotary pump from the freezing tank over this cooler, and returned direct to the tank; or, if desired, first go through coils in storerooms, and then back to the tank. This increases at the same time the circulation of the brine in the tank. If the machine is larger than necessary, and there is both lack of coils and cans, such brine cooler will enable you to make considerably more ice with very little expense for the addition; of course you must not expect great economy then.

The circulation in a brine tank is of vital importance. If the circulation is perfect the temperature of the brine should be the same on top and bottom and in all corners. This will enable you to work with the least possible difference in temperature between brine and expanding ammonia, and therefore will allow you a higher suction pressure than otherwise. Further, since transmission of heat depends also directly upon the velocity with which a substance is passing the cooling surfaces it is evident that the faster the brine moves the faster the ice will freeze and the more heat can be abstracted by the cooling coils. This explains why an open air brine cooler will do, with twenty feet of 2-inch pipe, the work of one ton of ice made, while in a freezing tank 260 feet are required per ton of ice made.

The best circulating device is a propeller about twenty inches diameter, but well proportioned, so as to get the highest effect with the least power, making about 160 revolutions. The tank must be constructed specially for this propeller, a partition must be put lengthwise in the tank with 12-inch openings at each end to allow the brine to pass from one compartment to the other. On one end of the tank in one compartment a short cross-partition, twelve inches from the end, must be provided, in the center of which the propeller is placed. The propeller must suck so as to avoid unnecessary friction by the brine striking the ice cans. With such circulation, if the tank is made long and narrow, the temperature of the brine will not vary more than ½° all around.

Mr. Siebert: I have prepared for your consideration a couple of articles on liquid air, and have here the results.

FACTS ABOUT LIQUID AIR.

The transportation of liquid presents a most difficult problem. In the attempt to accomplish this task three methods have been used, viz.:

1. *Shipping in Packages.*—In this case a double glass vessel, with vacuum between for insulation, and well insulated on the outside, is used. A cotton stopper is provided to allow air to escape and to maintain the remainder at a temperature of —312° F. After fourteen days all the liquid will be gone.

2. *Double Iron Vessels.*—In these air and liquid expanding from outer to inner vessel, thereby cooling the inner to —312° F. Provision is made for the escape of expanding air. Four per cent of the liquid will evaporate per hour, or a drum of liquid air will last twenty-five hours, when all the liquid will be gone. Professor Linde claims that this loss may be reduced to 1 per cent per hour, or a drum made to last four days, but certainly not longer.

3. *In Pipes.*—There must be one pipe centrally located in the other, the liquid flowing through the inner, and a certain quantity of it expanded in the annular space between the pipes. The loss would then be about 1 per cent, or if the pipe is 1¼-inch pipe, the loss per 200 feet would be one pound per hour.

COST TO PRODUCE LIQUID AIR.

Professor Linde, in a machine having a capacity of .9 quarts per hour, can produce 1.8 pounds of liquid air with three horse power, or 1.6 horse power per pound per hour; or, figuring the horse power at one cent per hour, at a cost of 1.6 cents. Mr. Tripler, with a machine producing 600 pounds per hour, can produce one pound of liquid air with three-fourths of a horse power; or, figuring the horse power at one cent per hour, the cost would be three-quarters cents per pound, which is the best obtainable.

VALUE OF LIQUID AIR.

1. *For Power Purposes.*—The best possible result, using one cylinder for evaporation and expansion, is $\frac{1}{100}$ horse power per pound of liquid air expended per hour. Using a separate evaporator and cylinder, separating evaporation and expansion, $\frac{1}{50}$ horse power per pound of liquid air expended per hour may be obtained. If we therefore take the value (commercially) of a horse power to equal one cent per hour, we have

the cost of a horse power by means of liquid air equal to fifty cents. But we will need 152 pounds, losing fifty-two pounds during ten hours by evaporation, when we have to use 100 pounds in ten hours for work; therefore the real cost is seventy-five cents per horse power per hour.

2. *For Refrigeration.*—The best possible result, using the highest possible value for latent heat, is: One pound of liquid air expended will do the work of one and one-quarter pounds of ice melted. To produce this one pound of liquid air in one hour, three-quarters horse power is required; therefore, we obtain for each horse power produced by one pound of liquid air, the equivalent of $1\frac{5}{8}$ pounds of ice melted.

A good ammonia machine, using water at 56°, as calculated for the liquid air machine, produces one ton of refrigeration per day with one and one-quarter horse power; or, one horse power will furnish the refrigerating work of 1,600 pounds of ice melted per day, or sixty-six pounds per hour, or forty times as much as can be done with the liquid air machine.

Mr. WATTS: In behalf of the members of the Indiana Association and also the Northern Association, I move that we thank Mr. Siebert for this paper.

Mr. LOUDEN: I heartily second the motion. [The motion was carried.]

The question of the nomination of officers for the ensuing year was then taken up and, at the suggestion of Mr. Frank, Mr. Van Gorder placed in nomination for president for the coming year Mr. W. H. Woodrow, of Chillicothe, Ohio, and moved that the balance of the officers be re-elected for another year by acclamation.

Mr. Barley said that he desired to resign from the office of vice-president for the state of Indiana, as he had retired from active participation in the ice manufacturing business, although he continued to be interested in the affairs of the Association, and would try to meet with them again next year; but suggested that another Indiana member be elected vice-president in his stead.

Mr. Eward placed in nomination Mr. Howard H. Leach, of Kokomo, Ind., for vice-president for the state of Indiana.

The motions were duly seconded and carried.

The following is a list of the newly elected officers for the ensuing year:

President.—Wm. H. Woodrow, Chillicothe, Ohio.

Vice-Presidents.—A. H. Hanley, Huntington, W. Va.; A. B. Leach, Wellston, Ohio; Lee Wilson, Olney, Ill.; H. H. Leach, Kokomo, Ind.

Secretary and Treasurer.—J. H. Frank, Alexandria, Ind.

The report of the secretary was then read, showing the amount of receipts and expenses for the year and stating that the membership of the Association had been increased by twelve new members during the year.

On motion, Indianapolis was selected as the place of meeting for next year.

The meeting then adjourned *sine die.*

SYNDICATE SCHEME FAILS.

THE many rumors that have been current for some months past, of a great combination of ice plants in Cleveland, Toledo, Columbus, Dayton, Indianapolis and several smaller cities—or rather, of the formation of a syndicate to buy up these plants—is now followed by the report that the scheme has been abandoned, partly because on account of the South African war the necessary funds could not be raised in England. So far so good. Any excuse is good for abandoning a failing enterprise.

[*Special Report for* ICE AND REFRIGERATION.]

SOUTHWESTERN ICE MAKERS.

FIFTH ANNUAL CONVENTION OF THE SOUTHWESTERN ICE MANUFACTURERS' ASSOCIATION—REPORT OF PROCEEDINGS—DELEGATES PRESENT—ELECTION OF OFFICERS AND COMMITTEES—PORTRAITS.

THE fifth annual convention of the Southwestern Ice Manufacturers' Association, representing ice manufacturers from Texas, Arkansas and Louisiana, met at the Oriental hotel, Dallas, Tex., on Tuesday, March 13, 1900. The Association convened at the T. P. A. rooms of the hotel, and was called to order by the president, Mr. C. W. Dawley, at eleven o'clock.

Among the delegates present were the following:

Henry Steinfeldt, Anheuser-Busch Brewing Association, Fort Worth, Tex.
Sam. Trubshaw, Geyser Ice Co., Waco, Tex.
E. Arnoldi, Shuman Ice Co., Shuman, Tex.
C W. Dawley, Shreveport Ice Co., Shreveport, La.
J. C. Mitchell, Temple Cold Storage and Ice Co., Temple, Tex.
A. Nicoud, Denison Crystal Ice Co., Denison, Tex.
J. D. Ambrose, Corsicana Ice Co., Corsicana, Tex.
A. Feickert, W. J. Lemp Ice Factory, Dallas, Tex.
E. W. Morton, Jr., McKinney Ice Co., McKinney, Tex.
F. M. Polhamius, Texarkana Ice Co., Texarkana, Tex.
W. H. Dawley, Paris Ice Co., Paris, Tex.
C. L. Wakefield, Paul Gallaway, Dallas Ice Factory, Light and Power Co., Dallas, Tex.
J. S. Phillips, Tyler Ice Co., Tyler, Tex.
J. W. Smith, Brenham Compress Oil and Manufacturing Co., Brenham, Tex.
B. D. Pickens, Waxahachie Ice Co., Waxahachie, Tex.
J. B. Murphy, Greenville Ice Co., Greenville, Tex.
Wesley Ambrose, Choctaw Ice Co., South McAllister, I. T.
E. S. Crumly, Home Ice Co., Hillsboro, Tex.
George Bond, San Angelo Ice and Power Co., San Angelo, Tex.
George Walter, of Terrell Ice Factory, Terrell, Tex.

Associate members:

E. P. Maddox, Fred W. Wolf Co., Fort Worth, Tex.
E. H. Kellogg & Co., New York, N. Y.
Joe Davis Oil Co., Houston, Tex.
J. L. Clark, of York Manufacturing Co., York, Pa.
Otto A. Koenig, Koenig & Luhrs Wagon Co., Quincy, Ill.
W. H. Strauss & Co., New York.
Chas. A. L. Loney, National Ammonia Co., St. Louis, Mo.
J. S. Wilkins, Herf & Frerichs Chemical Co., St. Louis, Mo.

The minutes of the last annual meeting were read and approved. The financial report of Secretary-Treasurer E. Arnoldi was read, and showed the amount of $150.40 on hand March 1, 1900, with collections of $360 up to date, leaving a total balance of $510.40 in the hands of the treasurer. Report was approved.

The secretary reported that several members had failed to pay their yearly dues, and on motion was instructed to strike the names of delinquent members from the roll.

The following applications for associate membership were voted upon, and the applicants duly elected: J. L. Clark, of the York Manufacturing Co., York, Pa.; Otto A. Koenig, of the Koenig & Luhrs Wagon Co., Quincy, Ill.; J. S. Wilkins, of Herf & Frerichs Chemical Co., St. Louis, Mo.; Chas. A. L. Loney, of the National Ammonia Co., St. Louis, Mo., and Strauss & Co., manufacturers of boiler compound, New York city.

The following telegrams were received and read to the Association:

ST. LOUIS, MO., March 13, 1900.

Texas Ice Association, Dallas, Tex.:

My heartiest greetings. May your deliberations prove most beneficial results for our common cause and interest. This is the wish of yours truly, WM. J. LEMP.

ST. LOUIS, MO., March 13, 1900.

Southwestern Ice Manufacturers Association, Dallas, Tex.:

Am just now informed that the Association is holding its fifth annual meeting in the good city of Dallas. I sincerely hope that your deliberations will be most friendly and enthusiastic for the maintenance of a strong union, concord and good relationship, and in sending my greetings to the Association, I say in union there is strength. Let our motto be: "Live and let live." Sincerely, ADOLPHUS BUSCH.

MARSHALL, TEX., March 13, 1900.

C. W. Dawley, President, Dallas, Tex.:

Sorry. Impossible to be with you. My best wishes for a successful meeting and a warm banquet. JEFF HICKS.

WACO, TEX., March 13, 1900.

E. Arnoldi, Secretary, Dallas, Tex.:

Regret my inability to be with you to-day. Hope your meeting will prove a grand success. JAS. E. EGAN.

Mr. F. M. Polhamius, chairman of the committee on programme, reported the following papers prepared:

"Experience with Furnaces." Jeff Hicks, of Marshall.

"Proper Relation of the Brewery to the Ice Business." A. Hamilton, of Houston.

"Observations of the Ice Business in Europe." Chas. A. L. Loney, of St. Louis.

"Crude Oil as a Fuel." J. L. Phillips, of Tyler.

The report of the committee on entertainment:

Reception of the visiting ladies at the parlors of the Oriental hotel. Banquet at 8 P. M.

Second day, 2 P. M. Ride over the city and barbecue at Oak Cliff park. On motion of Mr. Phillips all members who attended without their wives were requested to bring some lady friend to the banquet. Meeting adjourned to 3 P. M.

Afternoon session, 3 P. M. Meeting called to order, with the president, Mr. C. W. Dawley, in the chair, and all attending members present. Reading of papers declared in order.

Mr. Flint, of the Kellogg Oil Co., delivered a paper on "Cylinder Oils," which was highly appreciated.

Mr. J. S. Bonner, of the Southwestern Oil Co., detailed just what progress had been made with the refining of Texas oils and the future outcome of the use of said oils for lubricating purposes, as follows:

TEXAS CRUDE OILS.

Mr. President and Members of the Association: I will state that oil has been discovered in various parts of Texas, but none of the fields have been successfully developed, except at Corsicana, where the principal portion is in evidence and where the output is something over 3,000 barrels per day. This crude oil contains about 55 per cent carbon or burning oil stock, which is pronounced by those who know, to be equal, if not better, than the Pennsylvania crude. I am not able just now to give you the percentage of the other stocks, but enough to say that it contains very little lubricating oil, and later on they may turn out there a cheap grade of cylinder oil. The refinery which is in operation there at present, and which has a capacity of about 2,000 barrels per day, is not prepared for turning out lubricating oil of any quality. I believe, however, that they can furnish a cheap black oil which is used for various purposes. I understand that adjacent to Corsicana oil of a different nature has been discovered. This, it seems, contains a much larger per cent of lubricating oil, and no doubt if the supply is sufficient the refinery there will be enlarged so as to treat it.

Some years ago a heavy grade of oil was found at Nacogdoches. This was thought to be a very fine grade, but nothing much has ever become of it. Also an oil similar to the Nacogdoches oil has been discovered at Sour Lake. These oils may be all right when properly refined, but they contain considerable asphaltum, and without the proper facilities it cannot be separated, which facilities would constitute an up-to-date refinery, and the supply at present will not justify such an investment.

The parties controlling these wells have made several attempts at placing the oil on the market, but these attempts have been unsuccessful, as the refinery which they claim to have at Sour Lake, Tex., is not a refinery in the true sense of the word. Consequently, the asphaltum, grit, etc., which is very much in evidence, is not successfully separated. Therefore the oil cannot give the required service.

There are evidences of oil in other parts of Texas, but as to the merits and quantity of same, I am not able to say.

He was followed by Mr. Chas. A. L. Loney, on "Observations of the Ice Business in Europe," who spoke as follows:

Mr. President and Gentlemen: It is a long distance from Texas to the other side of the broad Atlantic, and the subject upon which I have been asked to make a few remarks does not seem to be one that would interest ice manufacturers of the southwest; consequently anything I have to say is not likely to be of any material benefit to the members present; but as I promised the programme committee to help fill out the bill, I will ask your kind indulgence for a few moments.

The average American tourist lands first at Liverpool. Here we find quite a number of immense cold storage warehouses, but no ice factories. There is plenty of refrigerating capacity in Liverpool, but it is all utilized for the purpose of refrigerating the immense quantities of meats that arrive at that point from this country and Australia.

You can imagine what this class of business means to Liverpool when I tell you that from the United States alone there is annually imported into England about $160,000,000 worth of refrigerated meats, not to speak of the mutton that is also imported into that country from Australia and New Zealand. A very large percentage of this business goes through the port of Liverpool, and is handled there; hence the cold storage business of this city is a very important factor.

Passing on from Liverpool, we come to the metropolis of the world, London. Here we find the ice business is in its infancy; up to a few years ago, not a pound of ice was manufactured in this great city, the source of supply being Norway. To give you an idea of the small ice business that is done there, I might say that on a hot summer's day the consumption of ice in this city, with its 6,500,000 people, is only 2,000 tons; whereas, New York, with 3,500,000 people, consumes about 20,000 tons. It is estimated that the annual consumption of ice in London is only 20,000 tons, against 5,000,000 tons in New York.

As far as I could observe or ascertain, there is not an ice wagon running in all London for private trade, the only wagons that one sees being used exclusively for the delivery of ice to fish mongers, butcher shops, hotels, hospitals and like institutions.

Should you want to obtain ice for domestic purposes over there, you must leave your order with a fishmonger, and he will deliver the cold commodity at your place of residence, and for sixpence (twelve cents) you will only obtain sufficient ice for a couple of good sized mint juleps.

Ice sells on an average for $6 per ton at the factory—that is to say, an English ton of 2,240 pounds—consequently one-eighth larger than our ton. Coal at the mine's mouth, in the north of England, costs about $1.50 per ton, but in London, 200 to 250 miles distant from the source of supply, it is worth $5 to $6 per ton, which coal is commonly known over here as "mine run" coal. This is owing to the want of competition among the railroads, there being so few, and their business so heavy that freight rates are exorbitant in the extreme.

The ice plants in operation in England are nearly all of the compression type, being a mixture of various English makes, with a sprinkling of Linde and De La Vergne plants.

We cross the English channel, and in a few hours are in the gay city of Paris. Here is to be found one of the original sulphuric dioxide machines, now forty-five years old, but still making ice in blocks of about sixty pounds in weight. There is nothing of particular interest to the observer of the ice business here except the odd way they have of delivering ice. It is carted around in ordinary ice wagons, and after being weighed by wagon scales, it is placed in a galvanized iron box about two feet long by one foot wide and about eight inches deep, with handles at each end, and is then carried into the building by two men, each one holding one of the handles. As far as I could learn, they have not yet been made acquainted with American ice hooks or tongs. The dioxide machines are being rapidly replaced by ammonia machines; and there has recently been added to the capacity of the city a 100-ton De LaVergne ice making plant.

In Switzerland there are no ice factories to speak of, a very fine grade of natural ice being harvested in the rivers flowing from the Alps, and in the famous lakes of this beautiful country.

When entering Italy by the west coast, the first town you reach that has an ice plant is Leghorn. This plant, of about twenty tons daily capacity, is kept in operation for the purpose of furnishing ice to the numerous warships of the various Mediterranean squadrons. While I was there Admiral Dewey's

flagship, the *Olympia*, was anchored in the harbor "icing," so to speak, preparing for its long journey to New York. The ice is sold to the warships upon a basis of $10 per English ton of 2,240 pounds, and the factory pays $7 per ton for English coal.

In Rome there are four ice factories, the output of which supplies the hotels, hospitals, etc. The Quirinal, the royal palace of the king of Italy, has a small De LaVergne machine of ten tons capacity, the same being used for refrigerating meat boxes, making a small quantity of ice and carafes.

The Neapolitans, as a general rule, are so poor that Naples cannot support ice factories worthy of notice. This city, the largest in Italy, with its 550,000 people, is said to contain more beggars than any other city in the world, irrespective of size. Ice is regarded here as a luxury, so much so that when I received my bill at the hotel, I found charged upon the same, twice a day, an item of twenty-five centesimi (five cents American money), for *glace* served to cool the wine I drank at lunch and at dinner. Thus I paid ten cents a day in order to get wine, the popular drink of the country, in a suitable condition to drink. It is hardly necessary to remark that it is only tourists, and the Americans in particular, who insist upon being served with ice. The Italians, seemingly, do not consider it necessary to cool their wine before drinking.

When making an inspection of the ruins of Pompeii, I saw no evidences of an ice making plant, although before the city was destroyed, 1,800 years ago, the wine dealers kept their products cool, as is evidenced by the sub-basements built below the wine stores, and which are intact even to this day. It would not have surprised me to have found some remnant of an ice making plant among the ruins, for the reason that the Pompeiians had everything that one could wish for. In the Pompeiian museum you can find almost everything from a bougie to a cooking stove, of which the modern appliance is but a copy, all of which were made of bronze.

There are no special features connected with the ice business in the other large cities of Italy until we come to Venice, which is probably the most remarkable city in the world. As all know, in this unique place all the streets are waterways. There is not a horse in the city, and ice is transported from the factories to the point of delivery in gondolas, and from the gondolas the delivery man carries the ice, in a peculiar sort of iron box strapped to his back, into the building. Reference to photographs furnished by me to ICE AND REFRIGERATION, and published in a recent issue, will more clearly define what I aim to illustrate. The blocks of ice weigh eighty pounds each, and two blocks are carried in each box.

During the time I was in Milan, there was an ice war existing between the old and a recently installed plant, a state of affairs not unfamiliar to ice men in this country. What this means can more readily be understood when it is considered that coal in Milan costs $8 per ton, the same, like nearly all the coal used in Italy, being Welsh steaming coal, probably the finest coal of its kind in the world. The one redeeming feature about ice making in Italy is the cheapness of labor. The usual wages paid are three liras (sixty cents) a day to engineers and one to two liras to firemen; drivers, wagon men and other help in like proportion.

In Austria-Hungary, Vienna and Buda Pesth, they have modern ice plants, and from these centrally located points most of the other cities of the empire obtain their ice supplies.

Nearly all the large cities of Germany have ice plants, although the business is very limited in amount. Even saloons do not buy ice, the owners finding their cellars sufficiently cool to keep lager beer in good condition. Germany has quite a few absorption plants; and I should say that 90 per cent of the compression machines are of the horizontal or Linde type.

There are not many machines in Holland or Belgium. Brussels consumes the largest amount of ice of any city in these countries; but like other countries of continental Europe, the principal customers for output are hotels, hospitals and similar institutions.

Outside of England, there is not much chance of immediate development of the ice business. Europeans do not take kindly to ice water; in fact, I am inclined to think that they detest the same. Ice water, I am told, was not thought of until the American tourists invaded Europe by the thousands. In hotels one never finds radishes, olives, celery, tomatoes, etc., served in ice, as we do in this country. I did not see a glass of ice water from the time I left New York until I returned there; and I am free to confess that I was not hunting for any, for the reason that there are so many other better and more palatable liquids waiting to be consumed.

This reminds me of an incident that occurred at the hotel I stayed at in Rome. While seated at a small dining table in the cafe of the place, waiting for my lunch to be served, a couple of American ladies were placed there also. After taking their order, the waiter handed them the wine cards, also tickets for them to write down what they wished to drink, which is the usual custom. The old girls, whom I should judge were maidens of fifty summers or thereabouts, and probably stanch members of the Methodist church, south, curtly replied: "We wish nothing but ice water," and with that they turned aside the wine card with evident anger. The waiter, a Swiss, gave them a withering look, and in a tone that was cynical, if not sarcastic, answered: "But pardon, madam, we do not serve ice water, but if you wish we will make some. Even then you must order same on the wine card, so that we can charge you for the ice." After vainly protesting against what they termed extortion, they signed the cards and obtained the much desired ice water. But I thought of the old saying: "When you are in Rome, do as the Romans do," which these old ladies evidently did not; or, if they did, conscientious scruples prevented them from indulging in what Romans drink, namely, "Chianti," the native claret.

J. L. PHILLIPS, TAYLOR, TEX.
President Southwestern Ice Manufacturers' Ass'n.

E. ARNOLDI, SHERMAN, TEX.
Secretary and Treasurer Southwestern Ice Manufacturers' Association.

L. L. WAKEFIELD, DALLAS, TEX.
Vice-Prest. Southwestern Ice Manufacturers' Ass'n.

The paper on "Crude Oil as a Fuel," by Mr. H. Phillips, of Tyler, was received with interest by the members. Various other topics pertaining to the manufacture of ice were discussed at length, much to the benefit and entertainment of the meeting.

On motion meeting adjourned to 10 A. M., March 14.

SECOND DAY'S SESSION.

Meeting was called to order by the president. The election of officers for the ensuing year being in order, the chair declared nominations for president in order. The name of Mr. J. L. Phillips, of Tyler, was placed in nomination by Mr. A. Nicoud, seconded by Mr. F. M. Polhamius, of Texarkana. There being no other nominations, on motion the secretary was instructed to cast the vote of the entire membership for Mr. J.

L. Phillips for president of the Association. The following officers were also elected by acclamation.

C. L. Wakefield, of Dallas, vice-president; E. Arnoldi, of Sherman, secretary and treasurer, A. Nicoud, A. Feichert, F. M. Polhamius, executive committee.

It was moved and seconded that a vote of thanks be tendered to the secretary-treasurer, E. Arnoldi, for his services rendered the Association for the past five years. Carried.

The selection for a place of meeting for next year being in order, the city of Waco was placed in nomination by Mr. W. H. Dawley, seconded by Mr. Mitchell, of Temple, and the city of Dallas was placed in nomination by Mr. C. W. Dawley, seconded by Mr. C. L. Wakefield. The ballot resulted in the selection of Dallas as the place for next meeting. On motion of Mr. Arnoldi the vote was made unanimous.

On motion of Mr. C. W. Dawley, the executive committee was instructed to act as committee on programme.

Motion was made by Mr. A. Nicoud that the following members be appointed on committee of entertainment for next year's meeting:

C. W. Dawley, A. Feichert and Paul Galloway, all of Dallas. The motion carried, and the president appointed the above gentlemen.

A motion by Mr. Dawley, seconded by Mr. Trubshaw, that the thanks of the Association be tendered to the committee on entertainment, and to the manager of the Oriental hotel for courtesies extended, was unanimously carried.

On motion of Mr. Polhamius the sincere thanks of the Association were expressed to the retiring president, Mr. C. W. Dawley, for his faithful services in the past.

Mr. Arnoldi moved that the thanks of the Association be also expressed to the Dallas press for courtesies shown the convention and its members. Unanimously carried.

A resolution by Mr. A. Nicoud, was unanimously adopted by a standing vote, viz.: That the sympathies of the Association are extended to the Gainesville Ice Co., of Gainesville, and the American Brewing Association of Houston, on account of their losses by death of G. M. Kinney, of Gainesville, and F. Hacker, of Houston.

On motion the meeting adjourned, to meet again at the Oriental hotel, Dallas, Tex., on March 12, 1901.

THE DRIVE.

In the afternoon, after the final adjournment, a carriage drive about the city was tendered to the members and their guests, and at the close they were treated to an old-fashioned barbecue at Oak Cliff park, all of which was much enjoyed. A number of the delegates, however, had been obliged to leave for their homes and missed this bit of Dallas hospitality.

THE BANQUET.

The banquet given to the members and invited friends at the Oriental hotel on the evening of the 13th, was declared in the local press to have been one of the most elaborate and elegant affairs ever given in Dallas. About 100 guests sat down to the well filled tables and did justice to the following:

MENU.

CAVIAR. BLUE POINTS.

GREEN TURTLE IMPERIAL.

SHERRY.

CELERY. OLIVES.

TERRINE DE FOIE GRAS, BELLEVUE.

"The cold brook candied with ice."

DIAMOND BACK TERRAPIN, NEWBURG,

HAUT SAUTERNE

"This sight stiffens all my operant powers,
Iced all my blood, benumbed my motion quite."

TENDERLOIN OF BEEF, BEARNAISE.

PARISIENNE POTATOES. FRENCH PEAS.

"Fine as ice ferns on January panes."

PONTET CANET.

ROMAN PUNCH.

"A little time will melt her frozen thoughts."

ROAST CANVAS BACK DUCK.

HOMINY CROQUETTES. CURRANT JELLY.

CHAMPAGNE

ASPARAGUS SALAD.

"Ye ice falls, ye that form the mountain brow,
Adown enormous ravines slope amain,
Motionless torrents; silent cataracts."

FANCY ICE CREAM, IN MOLDS.

ASSORTED CAKES. FRUIT.

"This weak impress of love is as a figure trenched in ice,
Which with one hour's heat dissolves to water,
And doth lose his form."

ROQUEFORT CHEESE. COFFEE.

Mr. A. Nicoud was toastmaster, and in introducing Mr. C. L. Wakefield, thus humorously described the situation of the banquet committee:

Ladies and Gentlemen:—The entertainment committee has requested me to explain to you the quandary in which they found themselves placed by their inability to carry out the programme that they had originally laid out for this evening's entertainment. They have met with a number of disappointments which they regret very much, as they have been compelled to call upon the good will of members of the Association to enliven and enlighten this reunion. The number of toasts to be responded to is small, and any one present who wishes to add his own efforts for the success of the meeting is kindly requested to make himself known to the toastmaster. It was the intention of the commitiee to have the members of the Association and their guests witness a theatrical performance by Sir Henry Irving in a new play called the "Daughter of Chile," but the late storms have so damaged the elaborate scenery that the opera house is dark to-night and no Chile can be served out. When this news came to disappoint the committee, telegrams were sent to endeavor to secure the presence of eminent orators. Wm. J. Bryan answered our request that there were sixteen chances to one that he could not spare us a night of his valuable time. Chauncey M. Depew, of national after-dinner fame, wired us his regrets, stating that his dress suit was out of repairs. Hon. Mark Hanna referred us to Hon. E. H. R. Green, who in turn referred us to Hon. Gooseneck McDonald, who again referred us to Hon. J. W. Bailey, and they all stated that they did not care to have anything to do with ice at the beginning of what is expected to be a hot political campaign. Cables sent to Lord Salisbury and to Oom Paul have remained unanswered, having been, no doubt, stopped by the censors. A spiritualistic communication was had with Bob Ingersoll, who in answer to our kind request for a few cheering words, stated that he had lost his voice on account of the very cold winter that raged in that region, notwithstanding the daily display of fireworks and brimstone. After these explanations, the truthfulness of which will no doubt be vouched for by the other members of the committee, I beg to introduce to you Mr. Wakefield, of the Dallas Ice, Light and Power Co., who will welcome you to the city of Dallas.

After Mr. Wakefield's cordial welcome, Mr. Sam Trubshaw, of Waco, responded to the toast, "The Reveries of the Ice Man, or What I Saw in a Block of Ice," as follows:

Mr. Chairman, Ladies and Gentlemen: We have listened to the speeches of our friends, Mr. Phillips and Mr. Dawley, and have partaken of the sumptuous feast spread before us, and gradually the frozen particles of our blood have thawed out under the benign influence of good fellowship and mellow wine; that is to say, those particles which were not already thawed out under the lightning flashes from the eyes of our lovely guests.

In answer to the call of a toast from me, I will give you, "The Reveries of the Ice Man, or What I Saw in a Block of Ice."

At first nothing; its cold, implacable face revealed no secrets; but gradually undefined shapes took form and suddenly its secrets lay expanded before my vision.

I saw the world in its prehistoric state, and where now we find eternal ice and snow I saw the flora and the fauna of our tropical zone. I found the secret of the mighty force of expansion (which, by the way, I would like to infuse into that first cousin of Jack Frost—Senator Hoar, of Massachusetts), a force which has rended mountains and changed the face of this mighty globe. Gradually the secret laws governing that mysterious force known as "contraction" were unraveled before me. Scientists have spent long and weary hours in deep research to find the laws governing this mighty force, but it has remained for the genius of an ice driver to solve the problem. A lady customer of mine complained to the driver that the piece of ice he was furnishing to her was mighty small, and she was not at all satisfied. Mr. Iceman answered her: "Madame, that is owing to the advancement of scientific principles. We are now freezing our ice at a lower temperature, and, as you know, the effect of cold is to contract, and following this principle the size of the piece of ice has also contracted, but the price is the same." The lady must have been satisfied with this scientific explanation, as she is still a customer of that driver.

Looking deeper, I saw the forms of Sisters of Mercy cooling the fevered brow of noble men, wounded in upholding their country's flag. I saw the piece of ice doing its share in the onward march of civilization, preserving the fruits of the toil of one man for the benefit and enjoyment of another; and gradually I heard the faint sound of sweet music emanating from its frozen breast. Thoughts of days long past swept through my brain, and once again I clasped the hand of youthful friend and drank old Luther's toast:

"Who loves not women, wine and song,
Remains a fool his whole life long."

The night well spent, but morning came at last, and gentlemen, you know the old pathetic story contained in that one word "morning." Shakespeare puts into the mouth of Richard III that cry of pent up fear: "A horse! a horse! my kingdom for a horse!" but we cry: "O! spirit that watches over those suffering the agonies of a splitting headache, send us the music of the clinky, clinkity, clink, of the ice cold pitcher of water," and then I awoke. I thank you.

Mr. J. L. Phillips, of Tyler, responded to the toast, "The Press," as follows:

Mr. Toastmaster, Ladies and Gentlemen: Were I not an ice man (a nice man), and therefore not averse to refrigeration, I would not have undertaken to respond to this toast. But feeling that my success will be measured here by the degrees of coldness created, you, I trust, are prepared for the production of a sample of liquid air.

The enterprise, the influence, the power of the press constitute the crowning glory of the close of this greatest century of all the ages. It is the glorious sun of enlightenment, whose advancing light is fast banishing from earth the curses of ignorance and superstition, and awakening in every continent and isle of the sea slumbering germs of truth, intellectuality and human liberty. Through the press the dull and heavy tomes of science, philosophy and history, done into reportorial and interesting English, give us daily instruction, so that a familiarity with the daily press is a liberal education, while as a purveyor of news it lays on our desks every morning the happiness of all the wide world, from the frozen Klondike to the sultry Philippines, from the czar to the Sultan of Sulu, to say nothing of the canals on Mars and the spots on the sun. It makes China our next door neighbor (whether the door be open or shut), and we can contemplate every morning, at a safe distance, the unspeakable Turk and the wild man of Borneo.

The proper limits of a toast response forbid that I shall attempt to cover the whole ground of a just eulogy of the press, yet I must not close without awarding its just meed of praise to the Texas daily press, and especially to the Dallas-Galveston *News*. We may differ with it on politics or on religion, but we can all heartily join in declaring it the greatest daily journal in the south, and faithfully devoted to the upbuilding and the prosperity of our greatest of states—Texas. Let us congratulate it upon never having had the yellow fever, and let us hope that it will never catch it from its New York contemporaries, and that it will prosper in the future, as in the past.

To the toast, "What Are We Here for?" Mr. E. Arnoldi, of Sherman, responded in a humorous vein. The pith of his remarks was to the effect that we are here for the purpose of having a good time, establishing good fellowship among one another, and to talk over troubles and differences that may have occurred in the past, and to obviate the same in the future.

To the toast, "The Ladies," Mr. H. W. Adams, of the Texas Coal Co., replied in a felicitous manner.

Remarks were also made by Messrs. P. Galloway, J. S. Bonner, and F. W. Flint. The banquet ended in the "wee sma' hours" by the singing of songs.

CONNECTICUT ICE DEALERS.

THE Connecticut Ice Dealers' Association held their annual meeting and banquet at the Tontine hotel, New Haven, Conn., on Thursday, March 22, 1900. It was said to be the largest convention ever held by the Association, seventy-four members, including twenty-five new members, taking part in the proceedings. Ice dealers from Massachusetts, Connecticut, Rhode Island and New York gathered about the well filled tables of the banquet hall at 2 P. M.

After the banquet an extended discussion took place, the chief interest centering upon the scarcity of the ice crop and the probability of high prices for the coming season. Treasurer Geo. H. Charter, of Hartford, remarked that the scarcity of ice accounted for the increase in attendance and the increase of new members, which was greater than in any year since 1890. It was also asserted that there was no inclination on the part of the dealers represented to form any combination or join the American Ice Co. They were individual dealers, and intended to remain such.

Mr. Charter did not state positively that the price of ice would increase materially this coming season, and said that while it might go up a little he did not think that the rise in price would be anything enormous. There is a plentiful supply on hand at present, but some difficulty might be experienced late in the season where supplies ran short and dealers would have to buy in Maine or Massachusetts.

The officers of the Association are E. A. Upson, of Bridgeport, president; G. E. French, of this city, vice-president; F. E. Perry, of New London, secretary, and George H. Charter, of Hartford, treasurer.

EGGS NOT INJURED BY COLD.

THE small effect of extremes of temperatures upon hens' eggs has already been the subject of frequent investigations, which have been published from time to time, and the series of experiments made in this matter by Sig. L. Salvioli will not be without interest. He put a large number of eggs into baths at temperatures ranging over and under the limits in which eggs can live. The eggs (part fresh and part in a more or less advanced state of incubation) were allowed to remain in the liquids. They were then put into the incubators, and observations taken. It was found that eggs treated before incubation easily resisted extremes of temperature. The limits between which the germ will live—according to these trials—were $+47.5^\circ$ to 48° down to -1° or lower. In the neighborhood of these extremes the eggs, according to circumstances, were more or less influenced. Thus eggs whose interior heat was found to be 46° incubated normally but slowly. At 47° they developed to the blastoderm, and embryo formation did not take place, and at 47.5° all were sterile. Reduction of temperature produced corresponding results. At 0° the embryo developed normally; many, however failed to mature. Even eggs partly frozen, whose temperature, however, did not get below 0.5° could still yield normal embryos; but in most cases development ceased. The resistance to these changes of temperature weakens with the development of the germ.—*Atti del Reale Instituto Veneto, 1899.*

[*Special Report for* ICE AND REFRIGERATION.]

ILLINOIS ICE MAKERS' CONVENTION.

SECOND ANNUAL CONVENTION OF ILLINOIS ICE MANUFACTURERS' ASSOCIATION—PROCEEDINGS—MATTERS DISCUSSED —ELECTION OF OFFICERS, PORTRAITS, ETC.

PURSUANT to call as published in the March issue of ICE AND REFRIGERATION, the second annual meeting of the Illinois Ice Manufacturers' Association was held at the Leland hotel, Springfield, Ill., on Tuesday, March 6, 1900.

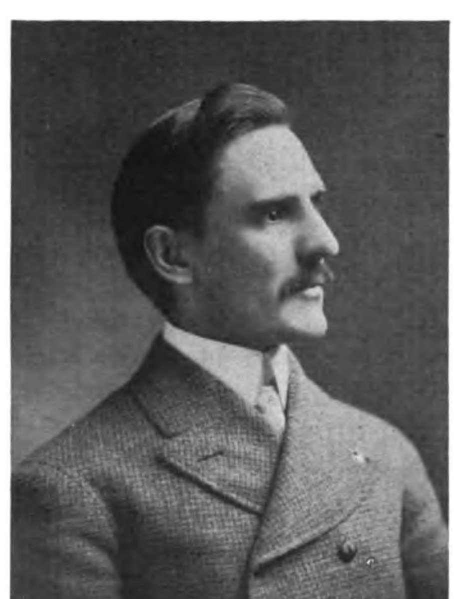
G. B. STORER, CHAMPAIGN, ILL.
President Illinois Ice Manufacturers' Ass'n.

C. L. BARTLETT, JACKSONVILE, ILL.
First Vice-President Illinois Ice Mnfrs.' Ass'n.

C. C. HACKNEY, AURORA, ILL.
Sec'y and Treas. Illinois Ice Manufacturers' Ass'n.

Among those present were the following: Mr. J. B. Gerlach, manager Chester Light, Water and Ice Co., Chester, Ill.; Mr. C. C. Hackney, manager Aurora Pure Ice and Cold Storage Co., Aurora, Ill.; Mr. Jos. L. Ebner, manager John Ebner Ice Co., Vincennes, Ind.; Mr. C. L. Bartlett, of Bartlett & Snyder, Jacksonville, Ill.; Mr. B. A. McGorray, manager Decatur Ice Factory, Decatur, Ill.; Mr. J. F. Nickerson, of ICE AND REFRIGERATION, Chicago.

J. D. GERLACH, CHESTER, ILL.
Member of Executive Committee.



HARRY SHLAUDEMAN, DECATUR, ILL.
Member of Executive Committee.

LEE WILSON, OLNEY, ILL.
Member of Executive Committee.

President G. B. Storer not being present, the meeting was called to order by First Vice-President C. L. Bartlett, at 3 P. M.

On motion the reading of the minutes of the previous meeting was dispensed with, as these had been published in full in ICE AND REFRIGERATION, the official organ.

Mr. Gerlach moved that the minutes of the last meeting, as published in ICE AND REFRIGERATION, be approved. The motion was seconded by Mr. McGorray, and carried.

The secretary and treasurer then read his report, showing receipts from membership fees and dues to be $75, with total expenditures of $47.76, leaving a balance of $27.24 on hand.

The secretary stated that an invitation had been sent to all the ice manufacturers in the state of Illinois, and that many replies had been received, and that many had not yet arrived who had promised to be in attendance at the meeting.

He announced that President Storer was prevented

by illness from being present, and suggested that some steps be taken to create a more general interest in the Association, and induce all ice manufacturers in the state to join.

On motion of Mr. McGorray, seconded by Mr. Ebner, the secretary and treasurer's report was adopted and approved.

Mr. McGorray suggested that the publishers of Ice and Refrigeration, the official organ, be requested to call the attention of the trade to the importance of joining the Association, and the benefits to be derived from attendance at the meetings.

Mr. Gerlach made a report from the committee on insurance, and referred to the fact that the Association was not in position at present to organize an insurance company, as the Illinois state insurance laws required a membership of at least 100 risks, or a total amount of at least $200,000 of insurance. He stated that there were only about forty ice plants in the state, and suggested that the only practical way was to co-operate with some other mutual insurance company. He gave instances of successful mutual insurance associations, referring to the Lumbermen's Insurance Co., and also to the Bankers' Mutual Burglar Insurance Co., and stated that many advantages were to be derived from such mutual associations, and that a great saving in premiums could be effected. He stated that the electric light plants in the state of Illinois, to the number of about 200, were now organizing a mutual insurance company, and suggested that the ice manufacturers might be combined with the electric light plants.

A general discussion was had on this subject, participated in by Messrs. Bartlett, McGorray, Ebner and Gerlach. Mr. Gerlach stated that reduced rates might be obtained from the regular board insurance companies by insuring as a body.

Mr. McGorray moved that Mr. Gerlach be appointed a committee of one to take up the insurance question, and make a thorough investigation, and report to the executive committee. Motion was seconded by Mr. Ebner, and carried.

The election of officers followed, and Mr. Gerlach moved that the secretary be instructed to cast one ballot for the re-election of the old officers, substituting Mr. Harry Shlaudeman, of Decatur, in place of Mr. J. W. Paddock, of Pana, as a member of the executive committee, Mr. Paddock having removed his ice plant to Toledo, Ohio. The motion was seconded by Mr. McGorray, and carried. The ballot was duly cast by the secretary. The following is the list of officers elected:

President, Mr. G. B. Storer, Champaign, Ill.

First vice-president, C. L. Bartlett, Jacksonville, Ill.

Second vice-president, J. L. Ebner, Vincennes, Ind.

Secretary and treasurer, C. C. Hackney, Aurora, Ill.

Members of the executive committee: Harry Shlaudeman, J. D. Gerlach and Lee Wilson.

The question of the next place of meeting was then taken up, and Mr. McGorray invited the Association to meet next year at Decatur. Mr. Gerlach moved that the invitation be accepted and the next meeting be held at Decatur. Motion was seconded by Mr. Ebner, and carried. On motion of Mr. Gerlach, the meeting then adjourned *sine die*.

A CORRECTION.

IN the account of the proceedings of the Southern Ice Exchange, in last month's issue of Ice and Refrigeration, the report of the discussion (page 199) following the reading of the paper on "Economy in Fuels," is criticised by Mr. Alfred Siebert, of St. Louis, who states that the stenographer omitted some things, and turned about other things so as to render unintelligible a part of the replies of Mr. Siebert to Mr. Skinkle.

The item thus imperfectly reported, Mr. Siebert says, should have read as follows:

Mr. Siebert: There is one clause in the article about saving of fuel in connection with a compound condensing ice machine, that I take exception to, because it is possible to save steam. Mr. Busch has an ice plant in St. Louis, where he uses compound condensing engines and makes 220 tons of ice, and uses in the boiler 150 pounds of steam, using also an evaporator with an expenditure of fuel 15 per cent. A 100-ton ice plant can be worked with about sixty tons of steam, using the steam from the boiler in a re-evaporator.

Say the steam has a pressure of 175 pounds; this steam is then sent into a kind of heater, and is used there to evaporate steam at 125 pounds pressure. The total heat is so little different at 175and 125 pounds that one pound of steam requires almost the same amount of heat; consequently a compound condensing engine will furnish you with sixty tons of original steam, 100 tons of condensed water, and this is about the limit in economy of a compound condensing engine. Of course, in this case an extra evaporator must be furnished to produce the extra forty tons of steam. Mr. Busch uses the exhaust steam for this purpose and loses fifteen inches vacuum in consequence. This, of course, increases the fuel consumption also 15 per cent; while when using live steam the expenditure of fuel is only 3 per cent. It is better to use the live steam than to use the exhaust, as Mr. Busch has done, for that purpose, if it can possibly be done.

Mr. Skinkle: I would like to ask Mr. Siebert if Mr. Busch has not abandoned the triple evaporator he had in use.

Mr. Siebert: No, sir, he has not done so. He has 15 per cent loss because he loses fifteen inches vacuum, having to work with ten inches instead of twenty-five inches to get sufficient difference of heat for re-evaporator. The difference of heat required per pound of steam at 125 and 175 is so small that you have a great advantage by using live steam. The temperature of the condensed water in the evaporator is about 340°, and the temperature of the condensed water in the condenser about 140°. Both mixed give about 240°. Therefore, you do not only get the water at 212° instead of at 140°, as you do in the ordinary way, but you get the reboiling for nothing. With the superheater or economizer you can superheat the steam coming from the re-evaporator, and another advantage is that there will be no priming, as the heat furnished has only little higher temperature. I must have a re-evaporator, absolutely. You will then make the ice with one-half of the coal, using twelve pounds of steam per horse power per hour.

[*Special Report for* ICE AND REFRIGERATION.]

WESTERN ICE MANUFACTURERS.

SECOND ANNUAL CONVENTION OF THE WESTERN ICE MANUFACTURERS' ASSOCIATION—MEMBERS PRESENT—GENERAL PROCEEDINGS—OFFICERS ELECTED, ETC.

PURSUANT to call, ice manufacturers of Missouri and Kansas met at Kansas City, Mo., March 14 and 15, 1900, the sessions being held in the Armour building, on Delaware street, thirty-three members, representing thirty different plants, and three associate members responding to the roll call.

Those present were:

W. H. Herd and A. E. Le Sturgeon, of the Polar Ice Co., Arkansas City, Kan.; John Heberank, of the

D. W. HOWARD, NEVADA, MO.
President Western Ice Manufacturers' Ass'n.

Independence Ice Co., Independence, Kan.; L. R. Roter, of the Parsons Ice and Coal Co., Parsons, Kan.; D. A. Crockett, of the Emporia Ice and Cold Storage Co., Emporia, Kan.; Jas. A. Kimball, of the Kansas Ice and Storage Co., Salina, Kan.; Wm. Moeser and Chas. Moeser, of the Moeser Ice and Cold Storage Co., Topeka, Kan.; Peter Olsen, of the Crystal Ice Co., Topeka, Kan.; Frank J. Thomas, of the Thomas Fuel Co., Atchison, Kan.; W. L. Dickey, of the Topeka Ice and Cold Storage Co., Topeka, Kan.; F. S. Entriken, of the McPherson Ice Manufacturing Co., McPherson, Kan.; W. N. Shepard, of the Coffeyville Ice Works, Coffeyville, Kan.; A. J. Griffin, Griffin Ice Co., Lawrence, Kan.; Frank Riddle, of the Iola Ice and Cold Storage Co., Iola, Kan.; A. D. Coon, of the Ft. Scott Ice Manufacturing Co., Ft. Scott, Kan.; D. W. Howard, of the Nevada Pure Ice Co., Nevada, Mo.; H. Colvert, of the Marshall Ice Co., Marshall, Mo.; J. L. Bolles, of the Dolds Pure Ice Co., Kansas City, Mo.; Harry Heberling, of the Warrensburg Ice and Cold Storage Co., Warrensburg, Mo.; E. R. Andler, of the Sedalia Ice and Cold Storage Co., Sedalia, Mo.; E. G. Cassidy, of the Lemp Sedalia Ice and Cold Storage Co., Sedalia, Mo.; W. S. Pomtius, of the Vanderslice-Lynds Mercantile Co., Kansas City, Mo.; A. Menny, of the Kansas City Ice and Cold Storage Co., Kansas City, Mo.; L. O. Walper, of the Webb City Ice and Cold Storage Co., Webb City, Mo.; F. O. Rettig, of the Grand Avenue Ice Co., Kansas City, Mo.; Armour Packing Co., Kansas City, Mo.; Ferd Heim Brewing Co., Kansas City, Mo.; L. C. Hamilton, of the St. Joe Artesian Ice and Cold Storage Co., St. Joe, Mo.; Joplin Brewing Co., Joplin, Mo.; F. A. Ellsner, of the Clinton Ice and Cold Storage Co., Clinton, Mo.; John De Vine and H. H. Techout, of the Des Moines Ice and Cold Storage Co., Des Moines, Iowa.

Associate members: Crane & Co., Kansas City, Mo.; English Supply Co., Kansas City, Mo.; National Ammonia Co., St. Louis, Mo.

Meeting was called to order by the president, Mr. D. W. Howard; Mr. A. Menny, secretary.

After address by the president, treasurer's report was read and approved.

Addresses on different subjects of interest to the Association were then made by the following gentlemen:

L. R. Roter, Parsons, Kan.; W. H. Shepard, Coffeyville, Kan.; Frank Riddle, Iola, Kan.; W. L. Dickey, Topeka, Kan.; Dr. D. W. Howard, Nevada, Mo.; E. R. Andler, Sedalia, Mo.; H. H. Techout, Des Moines, Iowa; Henry Heberling, Warrensburg, Mo., and F. A. Ellsner, Clinton, Mo.

It was moved and seconded that the secretary furnish to each member of the Association the names and capacity of the plants within the Association. Carried unanimously.

Meeting then adjourned until 9:30 A. M., March 15, 1900.

SECOND DAY'S SESSION.

Meeting was called to order at 9:30 A. M., March 15, 1900, by the president. All members present.

President D. W. Howard gave an address to the members on the subject of liquid air and its possible

L. C. HAMILTON, ST. JOSEPH, MO.
Vice-President Western Ice Manufacturers' Ass'n.

effect upon the ice business, calling attention to the Los Angeles liquid air plant, heretofore described in the columns of ICE AND REFRIGERATION, where it is promised that liquid air will supersede ice in maintaining low temperatures in refrigerator cars. The time is coming, thought Mr. Howard, when the ice

With the prescribed amount of forecooling in the slaughter house the amount of refrigeration in the cooling room or chilling room is reduced to 116,400 calories per hour.

3. The transmission of heat through walls, floors and ceiling of the chilling room, anteroom, etc., amounts to 58,500 calories per hour.

For ventilation purposes it is assumed that the total volume of air in the main cooling room, amounting to 11,600 cbm. (cubic meters) is to be replaced or renewed once every two hours, which requires an additional refrigeration of—

4. For refrigeration of air, 49,000 calories.

5. For drying of the fresh air, 70,000 calories.

6. The amount of heat equivalent to the work of the ventilators to be removed amounts to 16,400 calories. (For the purpose of this calculation it has been assumed that during a ten-fold circulation per hour of the total air contents—including the anteroom with 13,230 cbm.—the temperature is elevated .4° C.)

7. The ice production fixed at 250 kg. per hour, using 120 calories per kg. requires a refrigeration of 30,000 calories.

8. For losses of refrigeration not provided for, opening of doors, introduction of water for cleaning, heat introduced by workmen, etc., are added 20,000 calories.

This altogether brings the required refrigeration up to a total of 360,000 calories per hour. The refrigerating machines and apparatus were so proportioned that their capacity amounts to 400,000 calories per hour under normal operation, and to 450,000 calories per hour if forced to their maximum capacity.

The machinery and other refrigerating apparatus comprise: The compressors and attachments, condensers of atmospheric pattern, air coolers, ice plant (without provisions for making clear ice), with traveling crane, transmissions, ventilators or fans for the circulation of air, the exchangers which transfer the refrigeration from the outgoing foul air to the incoming fresh air, the ante-passages for the chilling room, which are of such size that the velocity of the air will not exceed ten meters per second. Besides these there are the measuring apparatus, such as self-registering distance thermometers and hydrometers with signal works, different normal thermometers, anemometers, indicators, revolution counters, etc.

The motive power is electricity from the municipal electric power plant. The compressors are driven by electric motors with 5,000 volts tension, while the electro-motors for the ventilators, ice generators and workshops are operated with 220 volts tension.

The motors for the compressors, with their attachments, are located in the engine room (Fig. 3), as are also the switches, the regulating valves for ammonia and air, the pressure gauges, the alarm signals for temperatures and moisture in the chilling rooms, etc.

The engine room is seventy-eight feet long, sixty-eight feet wide and 21.8 feet high. Below the engine room is a cellar, and the iron ceiling is supported by the outer and inner walls and three wrought iron columns. The floor is laid in Metlach tiles (red and yellow), and the walls are wainscoted with porcelain tiles (white and blue) to a height of about 6.4 feet.

In the construction of the engine room the enlargement of the plant was provided for in such a manner that the whole machinery can be duplicated at any time without interrupting the operation of the present appointments. At present there are three electro-motors and three compressors, which are duly protected by iron railings to prevent accidents as much as possible.

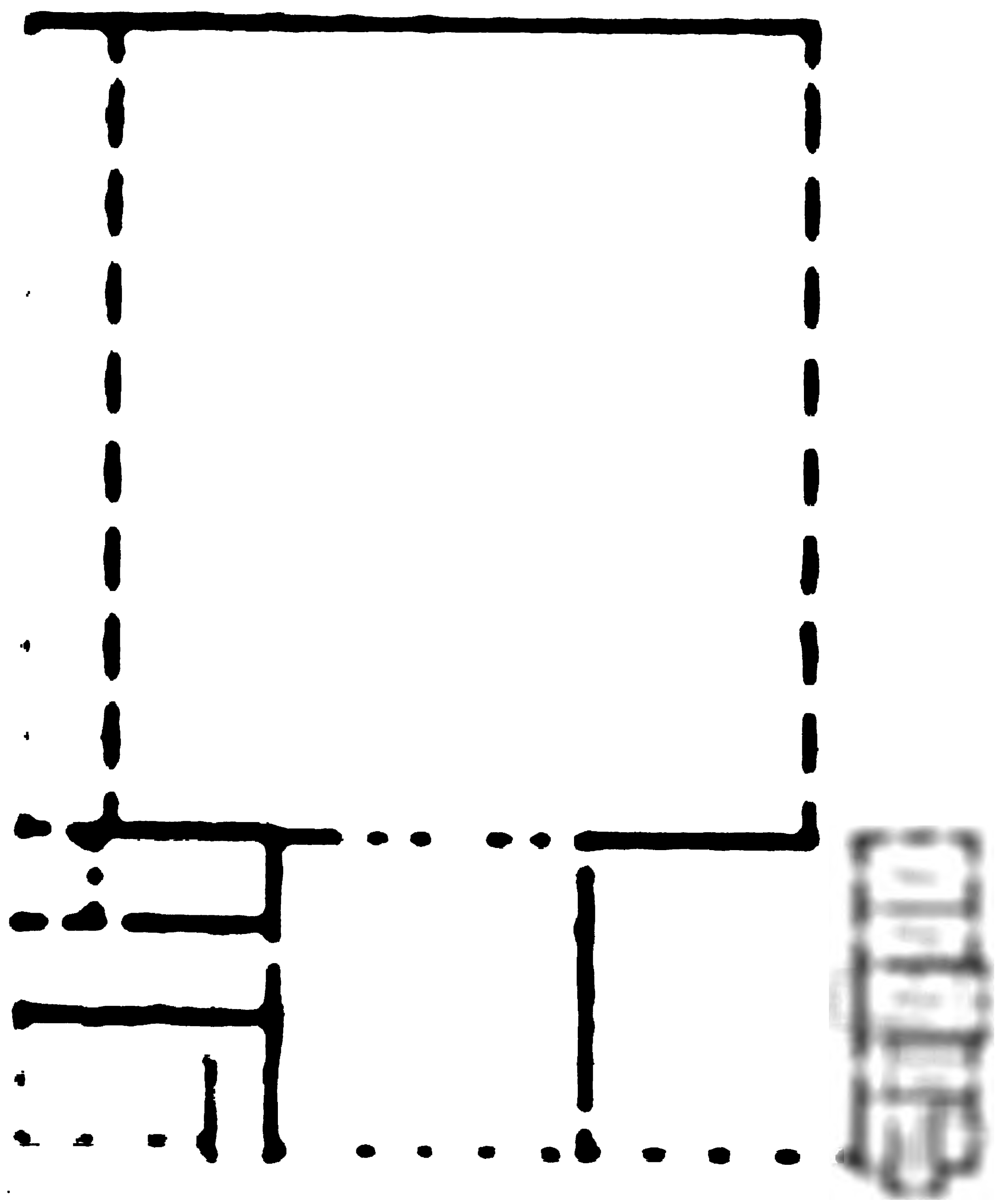
The power of two electro-motors, each of 110 to 125 horse powers capacity (with 5,000 volts tension and fifteen to twenty amperes current strength, and 210 revolutions per minute) is transmitted to the compressors by means of so called endless wire rope transmission. The motors are mounted on concrete foundations, and can be shifted, in slides, to an extent necessary to stretch the rope transmissions within the required limits. The arrangements also permit of an interchange of the motors in applying their power to the different compressors.

The compressors are built for a normal capacity of 133,000 calories, and for a maximum capacity of 150,000 calories per hour, with sixty-five revolutions per minute and a brine temperature of from —2° to —3° C., where the ammonia enters the refrigerator coils, and —5° to —6° C. where it leaves the same. The normal operation of the works calls for the production of 500 pounds of ice per hour in addition to the air cooling for the chilling and storage room. Two of the compressors are mounted on a common ground plate as double compressors, and the third compressor is arranged in such a manner that it may be complemented later on by a fourth compressor, thus forming another double compressor (Fig. 3).

The compressors rest on concrete foundations, built up from the sub-cellars, and can be operated singly and as a whole.

The pulleys of the electro-motors and the pulleys of the rope transmission have a diameter of 1.8 m., and those of the compressors 6.0 m. diameter. The thickness of the ropes is 50 mm. (millimeters). In order to facilitate the mounting and repairs a traveling crane of 8,000 kilograms capacity is also located in the building. The room is illuminated with electric arc and incandescent lights.

In order to be able to control the changes taking place in the cooling room with reference to temperature and moisture, self-registering hygrometers and thermometers, with signals for the lowest and highest permissible temperatures (respectively, 2° and 6° C.) are placed in the engine room. In order to facilitate the superintendence and operation of the boilers, etc., the pressure gauges, the regulating valves, the valves for the distribution of ammonia, the transmission clutches for the regulation of the air circulation and the working of the ventilators are also placed in the engine room at convenient places. The condenser room is seventy-seven feet long, seventy-seven feet wide and twenty-three feet high. It contains three condensers, each one having 200 qm. (square meters), in all 600 qm. cooling surface, which is utilized on the plan of an atmospheric condenser. The condensers are placed in large, flat basins, made of concrete, which receive the water trickling down over the condensers, and which are connected with the city sewerage (Fig. 4). Here also preparations



rooms, which are constructed from pumice stone concrete. The cooling rooms are accessible by means of two closely fitting doors, and are also provided with electric illumination and windows for inspection to enable the engineer to observe the freezing and thawing of the pipes without entering the rooms.

For the regulation of the air passages and the closing off of certain sections for thawing, etc., two large valves of two meters in diameter are provided, which can be operated from the engine room by means of link belt motion. For the packing of the valves, rubber rings of special construction are used. The cooling apparatus is operated by direct expansion, and is calculated to refrigerate and dry 120,000 cubic meters of air per hour in such a manner that, as a rule, two pipe systems of the cooling apparatus are in operation while the third one is closed for thawing off.

Cooled air is circulated by means of three fans 4.9 feet in diameter. They are coupled with electric

is built of brick, with sandstone trimmings, has a slate roof, and the cooling and chilling room proper covers a ground area of about 3,400 square meters, being 63 meters long, 54 meters wide, and 3.5 meters high. In this room there are 486 cells, built of wrought iron and provided with frames and meat-hooks (Fig. 5), and with a door that can be safely locked, viz.:

Seventy-two cells, each of three square meters floor area.

One hundred and forty-three cells, each of 4.5 square meters floor area.

Fifty-two cells, each of 6.0 square meters floor area.

Seven cells, each of 6.5 square meters floor area.

Twelve cells, each of 8.5 square meters floor area.

The rest of the floor area, amounting to about 1,483 square meters, is used for hanging meat, and is traversed by one longitudinal and nine cross-passages (Fig. 2).

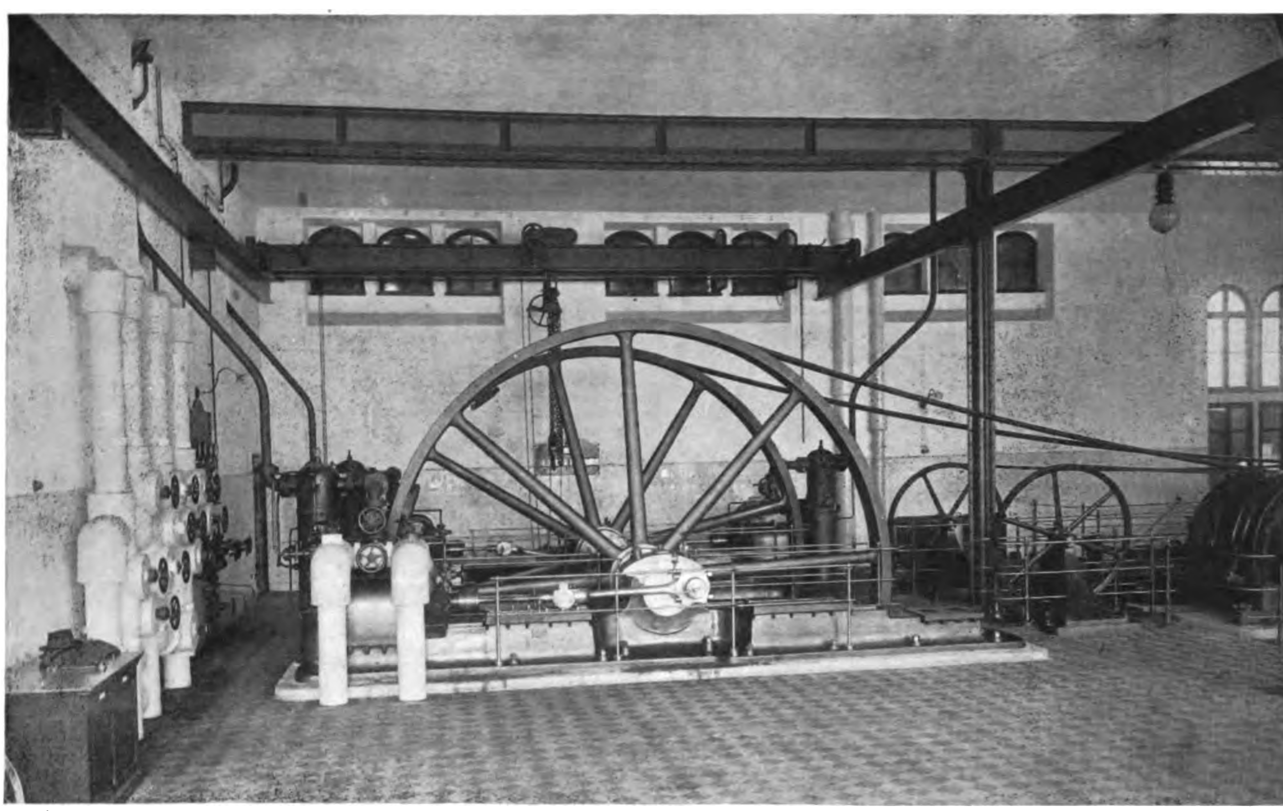


FIG. 3.—VIEW IN ENGINE ROOM, SHOWING COMPRESSORS, ETC.—MUNICIPAL SLAUGHTER HOUSE, MUNICH, BAVARIA.

motors from seven to nine horse powers strength, with 220 volts tension and 385 revolutions per minute.

In order to renew from time to time (usually every two hours), the cold air of the whole chilling and cooling room, a heat exchanger with 300 square meters heating surface is employed, and the exchange circulation is produced by two small fans of 1.3 horse powers each, making 800 revolutions, with a tension of 220 volts, thus providing for the forecooling of the fresh air by the outgoing spent air. These fans are also cóupled directly to the electro-motors.

For the extension of the plant, the room in the second floor, corresponding to that in the first floor, containing the machinery now in operation, is left empty at present. The water from thawing is carried off separately from each chamber into the city sewers, each conduit pipe being provided with traps.

The building for the refrigerating plant (Fig. 1)

Three hundred of the 486 cells were already in use by the time the establishment had been in operation two months. The air pressure channels are made of impregnated pine boards about twenty millimeters thick, and are located over the cells, while the air suction channels are located over the passages and are made of the same material. Sliding registers regulate the entrance of the cold air and the withdrawal of the cold air (Fig. 2).

The openings for the entrance and withdrawal of air are protected by means of wire screens, and there are also manholes in the channels, to facilitate cleaning them out whenever necessary. Provision is also made for the heating of the ingoing air in case that should become necessary.

For the illumination of the cooling room, skylights and electric incandescent lamps in the passages are provided for. Each cell is also provided with an in-

[*Written for* ICE AND REFRIGERATION.]

TO PROVE EFFICIENCY OF ICE MACHINES WITHOUT A TRIAL TEST.

WHY TESTS OF AMMONIA COMPRESSION MACHINES DO NOT PROVE EFFICIENCY OF MACHINE—INDICATOR ONLY INSTRUMENT WHICH PROVES EFFICIENCY—HOW APPLIED, ETC.

BY J. C. BERTSCH, M.E.

I HAVE reference to the ammonia compression machine only, and to prove something without testing it, might sound a little strange, but under the word "test" I understand the usual trial run of a plant after it has been erected.

Probably very few business men would buy an ice or a refrigerating plant without the provision in the contract, that a test of so and so many days or weeks, to be made in midsummer, etc. And yet, almost all of the so called tests don't prove anything; and by no means do they demonstrate the efficiency of the machinery, as it is a very easy matter to produce ten tons of ice with a regular 15-ton machine.

The purchasers of refrigerating machines are generally satisfied if the plant produces the number of tons of ice, or the temperature of the rooms, as specified in the contract. No one knows what the efficiency of his machine is and how much work it ought to do under varying conditions. But as soon as the machine does not perform according to contract, then the trouble begins. Then the purchaser blames the machine, and the builder of the same claims that the condensing water is too warm, the insulation too bad, the engineer no good, and everything else not furnished by him unsatisfactory and insufficient. Then all kinds of changes are proposed, more ammonia must be added to the charge, the size of the liquid pipes will be increased, a good deal of time and money will be spent and another trial run agreed upon.

So called experts then do their best to make the confusion still greater, and finally the whole case will be turned over into the hands of lawyers, and soon it appears on the calendar of the court. Experts and dozens of witnesses, pro and con, are heard, all kinds of laws and court decisions are cited and a great deal of money wasted. But nobody thinks of the only expert, the only witness, and the only evidence in the case—nobody thinks of the *indicator.*

And why? Because few people, handling only that class of machinery, know the importance of the indicator. Many believe it is only a plaything in the hands of a few cranks; and for good reasons some of the builders of ice machines are opposed to the application of the indicator to their machines.

But, as stated before, the indicator is the only instrument which proves the efficiency of ice and refrigerating machines beyond dispute. It proves it in a few hours, under any and all conditions, in midsummer as well as in midwinter, and all that is necessary in order to learn the application of the indicator, and to learn to read and to understand the indicator cards, is common sense and a good will.

It is not my intention to give you here instructions relating to the construction and the use of the indicator. For that purpose I refer you to an excellent book published by H. S. Rich & Co. under the title, "Indicating the Refrigerating Machine," by Gardner T. Voorhees.

What I intend to show you is the way to find the work of the machine, in every particular, on the card drawn by the indicator; and to begin with, we have to find out of what this work consists.

To do a certain quantity of work means to evaporate a certain amount of liquid ammonia. The duty of the machine is to remove that portion of the ammonia, which has become gas while performing the work of cooling, from the refrigerator to the condenser, where it is liquefied, to be used over and over again.

The more gas of a certain pressure the machine is capable of removing, the more work is done, and the efficiency of a machine is therefore measured by the weight of the ammonia gas actually removed, and we express the degree of efficiency in per cent of the nominal or theoretical weight of the ammonia gas we ought to remove if everything could work perfectly.

Very often we talk about the displacement of a machine, and calculate the capacity in so and so many cubic inches or cubic feet per ton of ice or refrigeration per minute. But such calculations are of no value whatever as long as we don't mention the pressure, temperature or weight of the gas we intend to work with, as the same volume of ammonia gas can have hundreds of different weights. As stated before, we must figure with the weight of the ammonia we have to evaporate in order to do a certain work, and the machine must be able to remove the given weight of ammonia gas.

The first important question now is: How large must the machine be? And in this respect most of the purchasers of ice and refrigerating machines don't realize the fact that a smaller machine with a high efficiency is far superior and more economical than a larger machine with a low efficiency. It is hard to believe, but still it is the absolute truth, that no one cares for the efficiency of the machine. All one may ask is: How large are your ammonia cylinders, and what is your guarantee on coal consumption? But what the guaranteed consumption of fuel amounts to, you all know well enough.

Instead of all the worthless specifications and guarantees we find in many contracts, we should specify, right with the quantity of work to be done, the condition under which it has to be done. We should state the temperature of the condensing water, the back pressure and the revolutions per minute, and then we should ask for a guarantee of the efficiency of the machine, and we should provide for a deduction of a certain sum for each per cent of efficiency the machine fails to perform. Such an agreement would be beyond dispute, and the guaranteed efficiency should be the scale for the purchase value of the machine.

The questions as to single-acting or double-acting, horizontal or vertical, oil or no oil, dry or wet gas machine, which trouble the purchaser of a machine for quite a while, would be of little importance, and would also be answered by the guarantee of efficiency. Then the purchaser would receive his money's worth, and many of the machine builders would either have

to quit the business or come up to the standard of high efficiency.

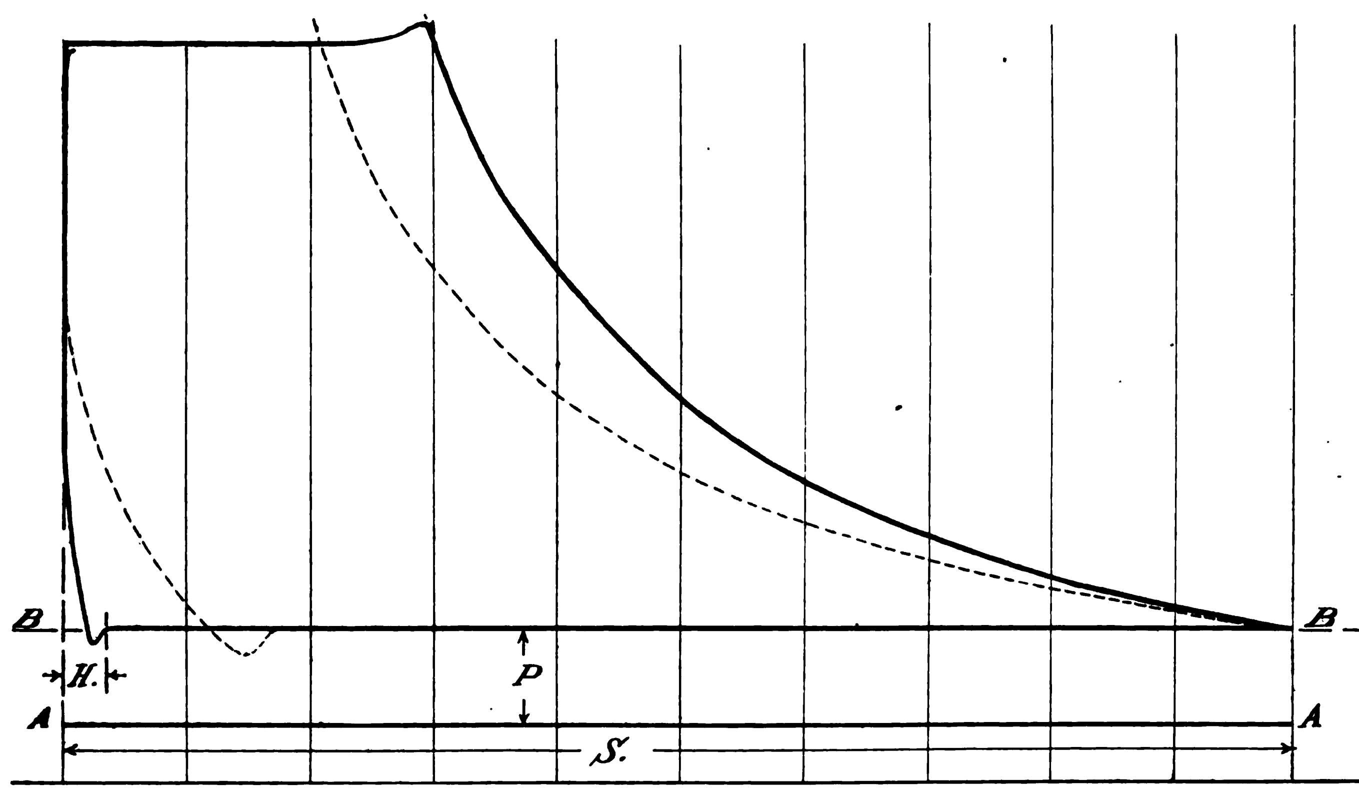
The second important question then is: How to prove the efficiency? As I said before, with the indicator. You can't prove it with large ammonia cylinders, or with the number of cans, or with the number of feet of pipe, or with anything else. I have seen plants with comparatively large machines and eighteen to twenty cans per ton of ice, not doing the work, and others with comparatively small machines and only fourteen cans per ton doing perfect work, which proves plainly enough that the result depends exclusively on the efficiency of the machine.

To arrive at a point where we can find the answer to both of the questions—size and efficiency of a machine—let me take an example, and allow me to use round and rough figures. Assuming that we need a machine to produce ten tons of refrigeration or six tons of ice per twenty-four hours with a temperature in the refrigerator of 15° F., a back pressure of twenty pounds gauge, a temperature in the condensing water of 80° F., a speed of 70 revolutions per minute and an efficiency of 90 per cent. Assuming further that under these conditions one pound of ammonia will do an absolute work of 450 B. T. U., then we would have to evaporate 6,250 pounds of ammonia, which would be equal to 50,000 cubic feet of ammonia gas under twenty pounds back pressure.

This volume of gas had to be removed by a machine working with 100 per cent efficiency. But as no such machine can be built, and the one in question would be guaranteed with 90 per cent efficiency, we must add 10 per cent for unavoidable losses, and our machine has to remove actually 55,000 cubic feet of ammonia gas per twenty-four hours, or 38.2 cubic feet per minute, which, with seventy revolutions, is equal to 472 cubic inches per stroke, or the cubic contents of the ammonia cylinder.

Now we have the answer to the first question, as the size of the machine would have to be $7\frac{1}{2}\times 11$ inches, and we would take one which comes the nearest to that size, say $7\frac{1}{2}\times 12$, which is a standard make and would give us 10 per cent more capacity, or would allow us to reduce the speed a little. But the reduction of the speed would also reduce the steam economy on account of a larger condensation. Any machine smaller than $7\frac{1}{2}\times 11$ will not do the work under the conditions stated above. But if some one insists upon using a larger machine in order to do this work, then his machine works with less efficiency and, therefore, costs more to operate and cannot be considered as good or worth as much as a first-class machine. And if any one should try to convince you that his larger machine is better because you could run the same with a slower speed, you can give him the lie right to his face, as every beginner in steam engineering can tell you that slower speed means waste of steam.

We see right here that the argument of the ice machine agent, that he will furnish a larger machine than his competitor, is rather against the interest of the purchaser than in favor of it; but in nine cases out of ten the same argument leads the purchaser to give the inferior machine the preference, because the man with the larger machine merely talks about the size, and doesn't say a single word about the efficiency of his inferior stuff.



INDICATOR DIAGRAM SHOWING PRESSURE OF GAS IN THE CYLINDER.

Now, assuming again that we have put up a machine of the size and under the conditions stated before, and we have to prove that the machine works with 90 per cent efficiency. In very few cases will we find the condensing water, back pressure, etc., exactly as stated in the contract; and, as mentioned already, both parties try then to take the best advantage of the new and different conditions.

But for my method of proving the efficiency it is of no importance whatever how these conditions have been changed, and this is the most valuable advantage

of the system I suggest. Let me show you my method first under the conditions agreed upon.

To find the efficiency I would take a few indicator cards. These cards would represent the work of our machine in every particular, and to translate this work from the cards in plain figures, we have to find out:

First.—If all the parts of the machine are working properly.

Second.—How many pounds of ammonia we have removed from the refrigerator, and—

Third.—How many pounds of ammonia we have discharged into the condenser.

Whether all the parts of the machine are working properly or not, we find by drawing the adiabatic line, which is explained in a splendid manner in the book, "Indicating the Refrigerating Machine," by Gardner T. Voorhees. There you will also find how to proceed if there should be anything wrong. And before you can go any further, you must remedy all the faults you have found, or compel the builder of the machine to do so, otherwise you cannot expect any result. As soon as the adiabatic line is correct, you know that there is no leaky valve or piston and you or the builder have done all that can be done, no matter how bad the work performed with the machine will be.

Now we go back to our indicator card and see how many pounds of ammonia gas we have taken out of the refrigerator. Assume that our card shall look like this figure.

The distance, *P*, between the atmospheric line, *A*, *A*, and the line, *B*, *B*, drawn by the indicator during the suction period, represents the pressure of the gas with which the cylinder is filled. We measure that distance with the same scale as that of the indicator spring, and find it is seventeen and one-half pounds, instead of twenty pounds, or the gauge back pressure. Here we have one of the unavoidable losses, as no machine can be filled with a gas of exactly the same pressure as that of the refrigerator or the gauge back pressure.

We know that our machine has a displacement of 38.2 cubic feet per minute, and as a gas of seventeen and one-half pounds pressure weighs .117 pound per cubic foot, our machine would remove from the refrigerator seventeen and one-half times .117, or 4.469 pounds of ammonia per minute.

Now we see how much we have discharged, and we find this by measuring the so called "heel," which has been for a long time the only interesting point on indicator cards. We know that the length, *S*, represents the length of the stroke, which we will call 100, and we find that the distance, *H*, is 3, when measured with that length, 100; or, in other words, we have discharged all but 3 per cent of the contents of our cylinder. This 3 per cent we must take from the 4.469 pounds we had found before, and we get then 4.335 pounds of ammonia absolutely removed from the refrigerator. The theoretical work of the machine would be 4.775 pounds, and as we have actually removed 4.335 pounds of ammonia, our machine is working with 4.335 divided by 4.775, or 91 per cent efficiency, instead of with 90 per cent, as guaranteed.

On the strength of such a result as shown by indicator cards you could accept your plant without taking any risk whatever, and without going to the expense of making a trial run of any length of time. You could be sure that the machine is working properly, and that the builder of the same did all that he promised to do.

But the conditions may be different. You may not be able to furnish condensing water at 80°, or the back pressure may be higher or lower while taking cards, or the speed may differ a few revolutions. It is all the same; the machine will show the same efficiency, but the work will be different; it may be more or less, according to the different conditions. If the condensing water is cooler or the back pressure higher, the machine will do more work; and if they are warmer or lower, the work will be less than guaranteed, and the builder of the machine should not and cannot be blamed for that as long as the efficiency of the machine is according to contract.

For an example let me take entirely different conditions. Say we find the condensing water at 90°, the back pressure at twenty-five pounds gauge and the speed at 77 revolutions per minute. We take again indicator cards and assume that the adiabatic line is correct. Under these conditions the theoretical weight removed by the machine would be forty-two cubic feet times .143 pound per cubic foot of gas, or equal to 6.006 pounds of ammonia per minute.

On the card we find the distance *P* at twenty-two and one-half pounds, and the corresponding weight of the gas would be .135 pound per cubic foot. The machine therefore would remove, per minute, forty-two times .135, or 5.67 pounds. The distance *H* we find again at 3 per cent of *S*, and the actual weight of gas removed would be 5.67, less 3 per cent, or 5.50 pounds, and therefore the efficiency of the machine, 5.50 divided by 6.006, or 91½ per cent.

If the machine would give a card with *P* equal to fifteen pounds pressure, and *H* equal to 12 per cent, we would remove forty-two times .109, or 4.578, less 12 per cent, which would give us only 4.029 pounds of gas per minute, and the efficiency would be then 4.029 divided by 6.006, or 67 per cent, instead of 90 per cent as per contract.

The assumption that a machine will work with such a low degree of efficiency is not at all mere guess work. I could show you dozens of cards taken by myself, which show even less than that, and there is no remedy possible, because the fault lies in the construction and in the system of the machine, which I will explain a little later on.

Many of you gentlemen may not agree with my way of testing a machine and would probably prefer to see the guaranteed number of tons of ice actually made. But how do you prove the refrigerating capacity? Or, for instance, you buy a machine of fifty tons ice making capacity, but only a 25-ton freezing outfit, with a view of putting in another 25-ton freezing outfit in a couple of years. How will you prove that your machine is able to make fifty tons of ice? You have to wait with the test until you get your second outfit, and if it should happen that you buy the same from some other concern and your first outfit is settled for, but fails to make the fifty tons of ice, the builder of your machine, in all probability, will tell you as soon as you complain: "We have nothing to do

with your plant; everything is settled." Therefore, gentlemen, is it not worth while to accept a new method of testing ice machines and making contracts for same, in order to be absolutely safe and prevent all the troubles of fighting and of wasting money?

If my method of proving the efficiency of ice machines would result in nothing else than to bring to light the most efficient machines built to-day, it would deserve to be adopted for general use, because it would establish a true scale of the value of the different machines, and the builder who would refuse to guarantee the same efficiency as his competitor, would demonstrate that his machine is not as good. All the other guarantees could be left out of the contract, as the degree of efficiency is always in a direct proportion to the economies in fuel and water.

We have seen that there are three items we must look after, and these are: 1, the adiabatic or compression line; 2, the pressure of the gas into the cylinder; and, 3, the percentage of re-expansion. Of these three items the first one must be perfect, no matter what kind of machine we consider.

A proper compression line proves nothing else than good workmanship, and a machine which fails in this respect, and which has leaky valves and piston, is simply not worth being operated. But faults of this character can be cured, and this with very little expense, too.

The second item, the pressure into the cylinder, is the most important one of all, because it cannot be remedied; and a machine which does not receive the gas with a pressure as nearly as possible like that of the gauge pressure cannot be considered as up-to-date, and should not be accepted.

I deem it proper to state, with the claim of a fault, the cause of it. We have been working with compression machines now for fully twenty-five years, and accept to-day all the proportions the inventors saw fit to choose at a time when nobody had any experience with that class of work. We are well informed about the velocity of water and steam, and we have all kinds of tables and rules by which to find the proper size of pipes to carry water and steam from one place to another, or to find out how large the valves of a steam engine must be to secure good work. Every beginner in steam engineering knows that the exhaust pipe of an engine or pump must be larger than the one for live steam. But what do we know about the size of pipes and valves for ammonia machines? Nothing at all! Do we copy to-day the steam engine as built by Watt? No, gentlemen, we have advanced with the times, and try every day to improve and to get better results.

How is it with the ammonia compression machines? With very few exceptions we simply copy and accept everything that Linde and Boyle, still great in their respective fields, considered to be right. And that conservative blind following the old road is the cause why we have machines running to-day with 50 and 60 per cent efficiency.

Whenever you cannot get very nearly the same pressure into your cylinder that you have at your refrigerator, the suction valves of your machines are too small. It is not the spring of the suction valve, as so many believe, but the size of the valve, which prevents the gas from entering the cylinder. Please take it as a rule: The larger the suction valve, the higher the efficiency of the machine; and the one with the largest suction valve is the best and most economical of all.

The third item, the percentage of re-expansion, is also a very important one. The more clearance we have between the piston and the cylinder head, the larger the re-expansion will be. A remedy for this fault is, on a good many machines, impossible, but on some machines that clearance can be regulated very easily, and these machines are naturally far superior to those first mentioned. Should you desire to look at an ice or refrigerating machine in the right light, always remember the two words: "Efficiency" and "Indicator."

NEW BOOKS.

DAS ERFINDERECHT DER WICHTIGSTEN STAATEN. Von R. Schmehlik in Stuttgart and Leipzig. Deutsche Verlags-Anstalt. 1900. 12mo, boards; pp. 296. Price, M. 1.50.

This is the second edition of this compact, but quite complete, exposition of the patent laws and the rules and regulations pertaining thereto in the different countries and governments of the world. The book likewise treats on the rules and regulations pertaining to trade marks, etc., and on the relations and contracts on these subjects between different countries. Inventors and those interested in the development of inventions will find this little book a very convenient aid.

LIQUID AIR AND THE LIQUEFACTION OF GASES. By T. O'Conor Sloane. Second edition. New York: Norman W. Henley & Co. 1900. 12mo, buckram; pp. 365. Price, $2.50.

First copyrighted in 1899, and already in its second edition, the demand for this book indicates the general interest which the recent developments in the application of liquefied air has aroused. Mr. Sloane gives a comprehensive account of the early efforts to liquefy the various so called permanent gases, and ends with full descriptions, in a popular rather than scientific vein, of the apparatus for liquefying air introduced by Tripler, by Linde and by Hampson. A fairly intelligible description of Tripler's apparatus is given, although it is added: "The construction of the liquefiers has not been fully divulged." The numerous illustrations in the book help to elucidate the text and add to its general interest.

DIE UMSCHAU. Published weekly by H. Bechhold, Frankfort-on-the-Main. Price, per quarter, M. 4.

Die Umschau is a weekly periodical which furnishes a comprehensive and regular review of the progress and movement in the sciences, arts and literature, and thus, doubtless, supplies a great want in these days of investigation, discoveries and inventions, in which it becomes almost impossible to obtain a general idea of the intellectual progress of the day, the material being too overwhelming and diffused, and frequently inaccessible without such aid as furnished by *Umschau*. The last issue before us contains, among others, a very interesting comparative review of the arms used in the Transvaal war; also a review of the theories on the formation of petroleum, and the regular information on current events, new books, recent inventions, etc.

THE American Ice Co., of New York, has absorbed the Knickerbocker Ice Co., which controlled an extensive ice business in Maine, New York, Baltimore and Washington. The price at which it was taken is given as $10,000,000. The Knickerbocker Ice Co., of Chicago, is still a separate corporation, and the change of name of its eastern namesake will avoid some confusion when the stocks are listed on the New York stock exchange.

——The Lincoln Safety Deposit Co., of New York city, has just completed extensive improvements in its cold storage plant. About 45,000 cubic feet of cold storage space has been added, making the total capacity 110,000 cubic feet.

THE OUTLOOK IN THE ICE TRADE.

ICE men generally are looking forward to a good season. The crop shortage, while it may serve to boost prices somewhat, is not great enough to create fears of insufficient supply. A feature of comparatively little importance, and yet doubtless influencing conditions, is the general advance in the prices of machinery, accessories, etc. The natural ice supply is no longer the important feature it once was, for now, if natural ice is scarce in any portion of the country, manufactured ice immediately takes its place. But the great advance in prices of the material needed to construct ice factories has already served to limit construction, and to that extent reduced competition and tends to advance prices.

THE Atlantic coast is to a considerable extent dependent upon the Maine ice crop. The latest reports indicate that along the Kennebec about 600,000 tons of new ice were harvested, which, with about 350,000 tons of old ice remaining gives a total of 950,000 tons. On the Penobscot the new crop housed is variously estimated at from 60,000 tons to 90,000 tons. The amount of old ice in the houses is given as 113,000 tons, making the aggregate about 200,000 tons, conservative estimates placing the total stock at 167,000 tons. At the maximum estimate the houses are about three-fourths full. Along the Hudson, however, whence New York city derives its chief supply, the open winter has permitted the gathering of less than half the usual crop. This is partly balanced, however, by the large stocks held over, estimated at between 1,000,000 and 1,500,000 tons. Altogether the prospects for an abundant supply of ice for the coast cities are not flattering, and prices may go high, but the much-talked-of ice famine, apparently exists only in the minds of would-be speculators.

NATURAL ICE NOTES.

——The Star Supply Co., of Bowling Green, Ohio, has purchased the business of the Bowling Green Ice and Fuel Co.

——It is reported that a combination of twelve ice dealers in Cincinnati, Ohio, has been formed, and that these will endeavor to control the retail prices in such a manner that all the companies may do a profitable business.

——The Middletown (N. Y.) Ice Co. has elected as officers for 1900: E. A. Brown, president; J. D. Wood, secretary and treasurer; L. G. Wilson, manager. The old board of directors was continued in office for another year.

——A farmer near Hillsboro, N. J., is credited with securing a good crop of ice by using a number of sheet-iron trays or cans, 14×8×20 inches, filling these with well water, and setting them out of doors to freeze during the cold spells.

——Eighteen acres of land on the shores of Pike lake, near Hartford, Wis., have been purchased by J. B. Day, representing a Chicago company. It is stated to be the company's intention to erect a number of ice houses during the summer.

——The American Ice Co., of New York, has acquired extensive properties along Pickering creek, in Charlestown and Schuylkill townships, Pa., and will build dams, and construct ice houses, making here one of the most extensive ice storage plants in the state.

——The Jackson (Mich.) Ice Co. has been reorganized, J. L. Mitchell and W. M. Palmer having been added to the corporate owners. The new officers are: President, Dr. J. L. Mitchell; vice-president, John Malancy; treasurer, Z. C. Eldred; secretary and general manager, W. M. Palmer.

——A new firm of ice dealers has been formed at Biddeford, Me., composed of Henry Wadlin and Clarence Dow, who have filled two houses with ice.

——The Monarch Ice Co. is the name of a new concern engaging in the ice business in Canton, Ohio, at wholesale and retail. C. C. Heaston is the manager.

——Application for receiver for the Spring Water Ice Co. at Milwaukee, Wis., was made last month, in order to settle the affairs of the company, the stockholders objecting to the transfer of the company's property to the Wisconsin Lakes Ice and Cartage Co.

——The American Ice Co. has purchased the ice plants of E. & I. K. Stetson, of the Owington Ice Co., of D. Sargent & Sons, and of the Arctic Ice Co., lying along the Penobscot river, in Maine. The aggregate sum paid for the plants is said to be $111,000. The capacity of the four plants is given as about 95,000 tons, and they contained at the time of the purchase 79,000 tons.

——The Pocono Spring Water Ice Co., Naomi Pines, Pa., has leased its extensive plant in the Pocono mountains, for a term of years, to the American Ice Co., of New York. The company controls 600 acres of spring water, and has harvested a total of about 200,000 tons of ice. The lessees pay a fixed rental, and also a royalty on each ton of ice secured.

NEW INCORPORATIONS.

——The Kansas Ice and Storage Co., Salina, Kan., has certified to an increase of capital from $50,000 to $75,000.

——Neosho Ice Co., Neosho, Mo., incorporated by A. Busch, A. Nicoud, A. Ruemmeli, E. and C. Haas. Capital, $30,000.

——Austin Ice and Bottling Co., Austin, Tex., incorporated by Joseph Breck, W. Quebedaux and W. G. Terry. Capital, $30,000.

——Joplin Ice and Cold Storage Co., of Joplin, Mo., incorporated by W. J. Louis and F. W. Lemp and others. Capital stock, $80,000.

——Clinton Ice and Manufacturing Co., Clinton, Iowa, incorporated by A. A. Parrett, F. C. Wood and Fred Ball. Capital, $20,000.

——Washington Ice Co., of Washington, Ind., incorporated by M. H. Gant, E. E. Gant and J. W. McCarthy, directors. Capital, $10,000.

——The Crystal Ice Co., Davenport, Iowa, incorporated by E. Wilkens, J. F. Brady, S. F. Smith, H. D. Linden and H. H. Vogt. Capital, $50,000.

——Temple Ice and Refrigerating Co., Temple, Tex., incorporated by A. Nicoud, A. T. Stevens, P. L. Downs and others. Capital, $30,000.

——Seabright Ice and Fish Co., Red Bank, N. J., incorporated by J. Lankin, J. Goldman, of New York, and J. H. Keller, of Seabright. Capital, $50,000.

——The Hygeian Ice and Cold Storage Co., Fall River, Mass., incorporated by Elmer B. Young, J. C. Mackenzie, C. H. Warner and others. Capital, $70,000.

——Islip Hygeia Ice Co., Islip, L. I., incorporated by John E. King, Caleb T. Smith, F. S. Whitman, G. O. Howell and Frank Parker, directors. Capital, $15,000.

——The Glasco Ice Co., Glasco, N. Y., incorporated by W. J. Schoonmaker, Charles Mulford, W. Tetter, J. Williamson, H. Low, C. T. Montgomery and others.

——Douglas S. Cone Ice and Refrigerating Co., Red Bluff, Cal., incorporated by D. S. Cone, A. K. Funk, G. H. Chase, M. R. Hook and F. H. Ransom. Capital, $50,000.

——Troy Cold Storage Co., Troy, N. Y., incorporated by M. E. Lawler, J. H. Cavanaugh, of Troy, and W. K. Frost, of Albany. Capital, $200,000. To succeed the firm of Lawler & Cavanaugh.

——General Refrigeration Co., Hoboken, N. J., incorporated by Thos. C. Wood, L. F. King, Thos. D. Rambaut and Ed. H. Wilson. Capital, $50,000. Objects: To build and operate a cold storage plant.

——Terre Haute (Ind.) Pipe Line Service Co., incorporated by W. P. Ijams, C. H. Goldsmith, Geo. E. West and others. Object, to construct pipe lines for refrigeration, preservation, etc. Capital, $500,000.

——The Hamlet Ice Co., Hamlet, N. C., incorporated by Chas. E. Johnson, Alf. A. Thompson and J. L. Skinner, all of Raleigh, N. C. Capital, $10,000, with privilege of increase to $50,000. Object, to manufacture ice, furnish cold storage, etc.

——The Tropical Ice and Cold Storage Co., Jacksonville, Fla., incorporated by William R. Moore, of Montgomery, Ala., and others. Capital, $20,000. Objects, to build and operate a plant for the manufacture of ice, for cold storage purposes, etc.

——Messrs. John Affleck and J. H. Quick, of Fond du Lac, Wis., have formed a copartnership, under the name of the Northwestern Cold Storage Co., to operate a cold storage plant in the old Treleven stone mill building, which has been fitted up for the preservation of perishable products. The new company will take possession April 1, 1900.

THE ASSOCIATIONS.

THE reports given in this issue, of the proceedings of the annual conventions of the Indiana and the Northern Ice Manufacturers' Association, as well as those of the Illinois Association, the Western and the Southwestern Associations, must furnish interesting reading for ice manufacturers in all parts of the country. The interest shown and the general acknowledgment of benefits received from thus associating for mutual helpfulness are encouraging.

That the discussions are of practical value was handsomely acknowledged by Mr. Martin, of the Indiana Association, when he stated that he believed the agitation started at this convention in reference to mutual insurance would result in lower insurance rates. "I know," he said, "that the former one helped me out 1½ per cent." That was a tangible, appreciable benefit sufficient to warrant his membership in the Association, even if he received no other benefit.

The question of insurance is an important one. As stated in the discussion, the insurance companies have looked upon ice factories very much as they did upon natural ice houses—as undesirable risks—when the facts are, that they present preferred risks, and should be classed accordingly. It is a noticeable fact that, as was stated in the convention, there had never been a single fire in any ice making plant in this region. Of course fires do occur in ice plants, but rarely, and still more rarely is the loss total. They are first-class risks. The agitation for lower rates should be continued, at all events.

The proposal made to establish a mutual insurance company by members of the Association may well command the most careful study and investigation. It is a notorious fact that most of the "mutual" insurance companies in this country, heretofore started, have come to grief. In the first place, a thing that is "everybody's business is nobody's business," and ice manufacturers have something else to attend to than the complicated and nicely adjusted business of fire insurance. If they hire some one to attend to it, they are more or less at his mercy. Then, again, risks vary greatly, and if a level premium is charged the owners of "good" risks will soon feel aggrieved at being obliged to pay for a neighbor's "poor" risk, and trouble will arise. If the premiums vary with the character of the risks, there is almost sure to arise bad blood over the classification, and more evil than good might result.

These suggestions are offered, not in the way of condemning or opposing co-operation in the matter of fire insurance by members of the Association, but as a mere reminder of some obstacles that must be patent to every member who thoughtfully considers this subject. It cannot be disputed that there are successful mutual fire insurance companies, but these, for the most part, are such as have a sufficiently extensive clientage to warrant the hiring of competent managers; or they have not been in the field long enough to furnish a precedent.

Some economical arrangement, along the lines suggested by a member of the Association, and which would not run counter to the state insurance laws, might prove valuable. For instance, the creation of a special fund within the Association to be used by the Association to reimburse any of its members who might suffer loss by fire, within certain definite limits; such fund to be invested in United States or other interest bearing bonds, and to be controlled by the executive committee, the benefits to be, of course, exclusively for members of the Association. It is quite possible that after the fund was once created, assessments at very rare intervals would suffice to give every member fire protection at a small fraction of the amounts now charged as premiums by regular insurance companies.

Such a plan in successful operation would add another powerful inducement for ice manufacturers, not already members of the Association, to become such. Another very important benefit that lies within reach of the Associations by concerted action and continued agitation, is the equalization of freight charges, and reduction of freight tariffs especially on fuel. The financial or economical benefits of a strong organization are not easily limited, while the social and fraternal relationships are abundant compensation for the sacrifice of time or money required. The more nearly the membership includes every manufacturer of ice in the district covered the greater the possible advantages to all. The man who thinks he has discovered a "snap" and stands aloof to guard his secret will awaken to the fact some day that while he was protecting his own little secret some other fellows had hit upon "secrets" of much greater value, of which he had all along remained ignorant because of his isolation or aloofness. We live in a rapid age and the wide-awake man who is up to all the improvements that any one has, is the one who will survive.

THE EGG STORAGE QUESTION.

THE inadequacy of cold storage facilities is often harped upon by interested parties. The man who has perishable food stuffs or other goods he wishes to have preserved wants plenty of cold storage room. But on the other hand, the owners and managers of cold storage plants also want to know—and rightly so—where their profits are to come from. The proprietors of many cold storage plants are obliged to become merchants; that is, to enter the market and buy when offerings are plenty, in order to keep their refrigerated space filled, and secure some compensation for the expense of running their machinery. Of course that means risk, and this involves the possibility of losses. A number of cold storage warehouse men, who bought heavily of eggs last spring, expecting to realize a fair profit on the fall or winter market, not only failed to realize sufficient to pay expenses, but were compelled to pocket losses of greater or lesser amounts. Hence, quite naturally, the question of egg storage is one of interest to the cold storage men this spring.

The views of egg shippers and receivers in varying parts of the country in reference to this matter have been published in a recent number of the *Egg Reporter*. Some of the opinions are based solely on price—unless a certain low price prevails no profit need be expected. Prices, on the whole, are gauged by the question of supply and demand. Hence one of the correspondents says that the problem is not so

much what price to pay as it is the quantity that shall be stored. Some of the men who lost on eggs last year will endeavor to recoup this year by buying cheaper eggs. "This," he says, "may be all right in theory, but in practice it works out the inevitable result—too many storage eggs in the fall." If a spirit of conservatism rules, each buyer cutting off but a small percentage of his customary purchases, the excess of offerings will drive down the price inevitably. The danger is, in fact, that buyers will go to the other extreme, and where they failed to make profit last year because of too much stock, they may fail this year because of having no stock, when the time arrives of fancy prices, because of short supply.

Most of the cold storage men who do not themselves buy eggs (or other perishable food products) make large advances on goods put in for storage by the merchants or commission men. On eggs two-thirds or more of the value at the time of storage is advanced usually, and the interest in prices is not thereby lessened. The general opinion in regard to prices that should rule, or probably will rule, for April storage eggs, ranges in the neighborhood of ten cents or eleven cents per dozen in Chicago. Excessive supply may lower this rate, and short supply raise it somewhat, but calculations on a ten-cent rate are being made by many cold storage warehouse men and commission agents. The price may rule considerably above this on the early offerings, but if the warehouse men will hold off until the flood of offerings which always gluts the market some time in April occurs, they will be able to fill their houses at prices that promise a fair profit.

A TRADES directory, or hand book, covering the ice making and refrigerating trades of Europe, Asia, Africa, British colonies and the United States, has been issued by our British contemporary, *Ice and Cold Storage*. This is the first compilation of the kind ever issued, and covers a wide field. The undertaking was an ambitious one, as besides the general directory, there are inserted tables of temperature, properties and capacities, a brief review of refrigeration in 1899, some patents of the year, etc. Many of the tables are reproduced from the "Compend of Mechanical Refrigeration," and duly accredited, although one of the most important of these tables is given without credit. We all know our British cousins are a little slow, still we must confess to some surprise at finding that Dewey's cannon, the roar of which we had fondly hoped had traveled round the world, has failed to apprise our British directory makers for 1900, that the Philippine islands, Cuba and Puerto Rico were no longer "Spanish possessions," and we believe they ought to have known that the Hawaiian islands are United States territory. But the lists for the United Kingdom seem to be quite complete, especially the list of vessels fitted with refrigerating machinery. So, too, the continent of Europe, though we looked in vain for the names of the manufacturers of ice machinery in Italy, established in 1899. As might be expected, the lists given for the United States are incomplete and inaccurate. On the whole, however, this volume, of over 300 pages, is a creditable one.

A GREAT SCHEME.

THE daily press has recently been printing elaborate articles describing a plan to build a great ship canal through Newark bay, and huge docks to accommodate all the shipping of the port of New York. The scheme is very broad, embracing extensive cold storages to handle meat and other perishable articles, etc. A company has been formed—on paper—with $50,000,000 capital, and elaborate and ornate pictures of the dock have been engraved. It is probable that beautiful stock certificates, with the American eagle on the back, will soon be printed, and then everything will be in readiness to launch the scheme and solicit subscriptions. It would seem there ought to be no difficulty in selling the stock in such a company as this when dupes can be found to invest in Keeley motor and liquid air schemes.

THE two American periodicals devoted to the natural ice interests, the *Ice World*, of Albany, N. Y., and the *Ice Trade Journal*, of Philadelphia, Pa., have been consolidated and are to be issued hereafter under the title of the *Ice Trade Journal*, as a semi-monthly, with headquarters in New York city. Mechanical refrigeration is encroaching more and more upon the natural ice business and limiting its field of usefulness, but there should be room still for one good periodical as its special representative. This is evidently a combination that is not a trust and cannot prove injurious to the trade. We wish it abundant success.

LIQUID AIR.

ALTHOUGH the information on the subject of liquid air given in ICE AND REFRIGERATION on numerous occasions, ever since Dewar produced it in small experimental quantities, has been at the time complete, exhaustive and up-to-date, it nevertheless becomes our duty to refer to the matter from time to time, though by doing so we may be repeating ourselves.

This necessity is brought about by constant allusions to the subject in lectures and in the daily press in the form of advertisements, reports on lecture experiments, and the like; ostensibly and chiefly for the sole purpose of selling stock in liquid air companies. As a matter of fact none of these publications contain anything by which a careful technical reader could be deceived into believing in an immediate future for liquid air; still the constant repetition of fictitious propositions and astounding experiments seems to carry conviction with many people, for the money to pay for these various "pipers" for liquid air must come from somewhere.

The experiments made at these liquid air lectures, notably also by Mr. Tripler, the chief promoter of liquid air, are not materially different from those made by Dewar, Linde and others several years ago, when they were fully described and illustrated in ICE AND REFRIGERATION. Yet, however interesting and sensational these experiments must be to the scientist and the curiosity seeker, they fail entirely to illustrate the practical usefulness of liquid air, for the boiling of a liquid (air) in a kettle standing on ice, or the formation of ice in a kettle standing on fire will hardly

ever become subjects for commercial application. Nevertheless, those and other feats not in the least surprising to the scientist do not only attract the attention of the public (as well they might), but they also inspire them with a wrong idea of the possibilities of the future of liquid air. This seems to be all that is wanted to divert the money which a gullible public heretofore invested in salted mines, etc., into the channels of the companies heralding liquid air, of which subject the public is still in blissful ignorance, and therefore very sanguine in its expectations relating thereto.

That these expectations will never be realized, hardly needs mentioning in these columns, but by way of recapitulation we may say that a comparatively small, if otherwise successful, liquid air plant will suffice to supply all the liquid air legitimately wanted for some time to come—that is, for lecture purposes, hospitals, surgical operations, industrial experiments.

These industrial experiments, which are made by professional men, and not by those parading themselves as stock jobbers and promoters, will doubtless bring out some useful and commercial applications of liquid air on a larger scale; but not until this is accomplished will it be time to organize companies for the development of such, as yet still prospective, improvements.

Evidently the liquid air schemes advertised nowadays do not propose to await the development of such legitimate researches, otherwise they would not continue their everlasting harping, in their lectures, as well as in their advertisements, on the extensive use of liquid air for refrigeration and power. After the thorough exposition of these subjects by Prof. Linde, the inventor and developer of the successful method of producing liquid air on a commercial scale, there is no longer any doubt that this substance cannot compete with the present methods of refrigeration and power, even if it were known how to produce liquid air at the lowest cost theoretically possible. This conclusion, fortified by practical experience, is in perfect keeping with all the other facts comprised by the science of thermodynamics, and makes any further argument superfluous. The circumstance that these patent facts are persistently ignored by the liquid air promoters, plainly shows their sinister motives and the mercenary end for which they are working.

In this connection we are pleased to learn that in keeping with the foregoing, Mr. Hudson Maxim, the well known inventor and engineer, has published a card disclaiming any responsibility for the claims for liquid air which are now being made.

COLD STORAGE MEN MEET.

PROPRIETORS of cold storage warehouses representing plants in Buffalo, Pittsburg, Cincinnati, New York and Chicago met for conference at the Iroquois hotel, Buffalo, N. Y., March 22, to discuss prices and devise plans to prevent rate cutting, and to equalize charges for cold storage of different products so far as possible. Nothing definite was accomplished, however, and a further conference is to be held at the same place the first week in April, when a large attendance is expected and definite results hoped for.

ABSORPTION OF ODORS BY MILK.

H. L. RUSSELL, of the Wisconsin experiment station, made a number of tests to show the relative absorption of odors in warm and cold milk. The method employed in the experiments is described as follows:

> A large box, with a tight fitting cover, was taken, and in the bottom of the same were placed two jars, one filled with warm water, and the other with ice or cold water. On the surface of each receptacle was then placed a basin filled with milk. The relatively large body of warm and cold water maintained the respective milk samples at temperatures above and below that of the surrounding air. In the bottom of the box were then placed samples of various substances that were to be tested as to their odor yielding properties. In passing judgment on the relative absorption of odors, the samples of milk that had been exposed were placed in glass bottles, and then brought to the same temperature, care being taken to thoroughly mix the samples so that no physical difference could be detected that would enable the scorers to recognize the respective samples as they tested them from day to day.

Trials were made with corn silage, horse manure, urine of cows and the oils of cinnamon, wintergreen and peppermint. The results on the whole are considered as showing that, contrary to general belief, warm milk absorbs odors more rapidly than cold. The relative absorption of the different odors was tested, it being shown that peppermint was absorbed the most readily.

CREAMERY ITEMS.

——The Continental Creamery Co. has been incorporated at Denver, Colo., by W. F. Jensen, J. S. Parks, C. H. Pattison and J. E. Nissley.

——Mr. F. King, secretary of the Board of Trade of Kingston, Ont., is making preparations to secure the establishment of a cold storage plant in connection with the local dairy school.

——The Girard Creamery and Cold Storage Co. has been organized at Girard, Kan., and incorporated with a capital of $5,000, to build and operate a creamery and cold storage room.

——H. R. Peacock, manager of the Traver creamery, at Traver, Cal., is preparing to equip his plant with a 2-ton refrigerating machine, to take the place of the ice he is now using.

——A dividend of 18 per cent has been set aside by the Richmond Mercantile and Creamery Co., of Richmond, Utah, for the purpose of installing a cold storage plant at the creamery.

——The dairymen of Smyrna, N. Y., have organized a stock company and are building a factory near the Ontario & Western depot for the purpose of manufacturing their milk into butter and cheese.

——The Hills Siding Creamery Co., of Hills Siding, N. Y., has been organized with a capital of $10,000. Incorporators: J. McCallister, J. Pittick, J. E. Hartman, J. Knebel, W. H. Slaughter, all of Hills Siding, N. Y.

——Creameries at St. Paul, Minn., are shipping butter packed in one, two and three-pound cans, to Japan. It is shipped to the Pacific coast in refrigerator cars, thence in refrigerator steamers to Japan, where it is said to arrive in good condition.

——The Winterport Creamery Co., of Winterport, N. Y., has been incorporated with a capital of $5,000. The purpose of the company is to manufacture dairy products. Incorporators: C. A. McKenney, C. R. Hill, S. C. Thompson and W. D. Thompson, all of Winterport.

——The Crescent Creamery cold storage plant, Tacoma, Wash., which has stood idle for more than seven years past, is to be again put in operation by the Pacific Cold Storage Co., Chester Thorne, president. Mr. Thorne purchased the property at receiver's sale several years ago for about $30,000. It is said to be the most complete plant of its kind on the Pacific coast, and is to be further improved.

[*Compiled Especially for* ICE AND REFRIGERATION.]

THE ANNUAL PRICE LIST.

QUOTATIONS OF PREVAILING PRICES FOR ICE IN THE VARIOUS SECTIONS OF THE UNITED STATES—A REVIEW AS OUTLINED BY OUR CORRESPONDENTS.

THE following review of the quotations for ice, which now obtain, and those which are likely to rule during the coming season, has been compiled from data sent us by our readers and will prove significant of the opinions that prevail regarding the business for 1900. The general shortage of natural ice in many sections, as compared with last year, and the greater cost of harvesting, may have a more considerable influence upon prices than is as yet understood.

PRICES NOW IN FORCE.

ALABAMA.

Decatur.—Decatur Ice and Coal Co.: Retail, in ton lots, $5 per ton. In 100-lb. lots, 35c. per 100 lbs.; 50 lbs., 40c. per 100 lbs.; less than 50 lbs., ½c. per lb. Wholesale price not fixed. Rate wars are anticipated in various points near here, where the capacity of the plants greatly exceeds the local demand.

Tuscaloosa.—Tuscaloosa Ice and Light Co.: Retail price for ice here is 25c. per 100 lbs. Outlook for business is good.

ARIZONA.

Phoenix.—S. D. Lount & Son: Price for ice same as last year, *i. e.*, 50c. per 100 lbs.; over 100 lbs., ½c. per lb. No ice of any kind in storage, as our capacity is plenty large without anything in store. We have a 25-ton plant, which makes 43 tons daily capacity in the place. The outlook here is for plenty of sales and mighty small profits.

ARKANSAS.

Fayetteville.—Fayetteville Ice and Cold Storage Co.: Retail price of ice, same as last year, ½c. per lb. Wholesale prices, $3.25 per ton. No natural ice. Prospects for business good, as the outlook for fruit crop is excellent, and that makes the ice business good.

Hot Springs.—City and People's Ice Co.: Our present and summer rates at wholesale are from $4 to $5 per ton. Retail: 2,000-lb. ticket, $7.50; 1,000-lb. ticket, $4.25; 500-lb. ticket, $2.50; 100-lb. and less, 50c. Ice consumption here is about 20 to 25 tons per day. Capacity of factories, about 50 tons. No natural ice.

CALIFORNIA.

San Francisco—San Francisco, Oakland and Alameda together produce yearly about 30,000 tons of manufactured ice. The total consumption is placed at about 50,000 tons, the deficit being supplied by natural ice harvested in the Sierra Nevada mountains. Prices for the season are, retail: 10 to 30 lbs. at $1 per 100; 50 to 100 lbs. at 60c. per 100; 100 to 300 lbs. at 50c. per 100; 300 to 600 lbs., 40c. per 100; 600 to 900 lbs., 35c. per 100; 900 to 2,000 lbs., 30c. per 100; per ton or over, 25c. per 100 lbs. This represents an increase of from 10 to 30 per cent on last year's prices.

COLORADO.

Greeley.—Greeley Ice and Storage Co.: There was little natural ice stored here, and that of inferior quality. Prices for natural ice, $3 to $5 per ton; for manufactured, $3 to $8 per ton. Our prices will be $3 in ton lots; $5 per ton to hotels, restaurants and saloons, and $8 to $10 per ton to family trade. Our plant capacity, ten tons per day. Nearest factories in Denver. The outlook for the season of 1900 in this section looks very bright.

Pueblo.—The Crystal Ice Co.: Not over half a crop has been harvested in this section, but quality is good. Ice is now selling at $4 per ton f.o.b. cars at Pueblo for manufactured ice. Natural ice is not quoted, as houses will not be opened till June.

DELAWARE.

Dover.—Henry I. Beers, Jr.: Prices for ice range same as last year, *i. e.*, in small lots at ½c. per lb.; 200-lb. block, 80c.; 1,000-lbs., $2.50. Car load lots, $3 per ton. About 1,000 tons of natural ice have been stored. The ponds from which it was cut were frozen over three different times to a thickness of six inches during January and February—something which has not happened before in the memory of the oldest inhabitant. Most of this was put up by butchers and dairies for their own use. The prospects for ice business are very good. The berry and peach crops promise to be large, and as these are shipped in refrigerator cars, make a market for considerable ice.

Wilmington.—Diamond Ice Co: Our prices so far same as last year. Prices for season not yet fixed. About 7,000 tons of natural ice have been housed and some 10,000 tons of manufactured ice is in storage. The factories here have a capacity of 120 tons daily. Outlook for season's business is good.

FLORIDA.

Sanford.—Sanford Ice Co.: Retail prices for season not yet fixed. Will probably be slightly lower than at present. Prices now for 100 lbs., 65c.; 200 lbs. at 60c. per cwt.; 500 lbs. at 50c. per cwt.; 1,000 lbs. at 45c. per cwt. Prospects better than in 1899.

GEORGIA.

Atlanta.—Standard Ice Co.: Our prices are about the same as last year, *i. e.*, 20c. per 100 lbs., $2.50 a ton. Only a slight advance is anticipated during 1900, made to cover the increased charges on coal, etc.

Augusta.—Consumers' Ice Delivery Co.: Prices, wholesale, $2.50 per ton. Retail, delivered, 25 lbs., 7c.; 50 lbs., 12½c.; 100 lbs., 17½c.; for 200 lbs. over, 15c. per 100 lbs. Prospects for good business are extremely good. Large fruit crop predicted.

IDAHO.

Boise.—Boise Ice Co.: Retail price, 10 lbs. daily, 70c. per 100 lbs.; over 10 lbs. to 100 lbs., @ 60c. per 100. By the ton, 50c. per 100. Only 3,000 tons were harvested, one-third less than last year.

ILLINOIS.

Chester.—Chester Light, Water and Ice Co.: Wholesale price in car lots, $1.50 per ton. Will probably be advanced during season to $2.00 or $2.50. Retail prices, 35c. to 75c. per 100 lbs. Very little natural ice harvested. Capacity of ice factories, 15 tons daily. Prospects good.

Moline.—The ice dealers have decided to adopt the coupon system. Books at $2.50 each will be issued, and a rebate of 50 cents will be allowed patrons consuming ice to that extent each month. The price will be 20 to 25 cents for 100 pounds.

Olney.—Olney Artificial Ice and Cold Storage Co.: Wholesale price in car lots at plant, $2.50 to $3.50 per ton. Retail prices, 300 lbs. or over, 30c. per cwt.; 100 lbs., @ 40c.; 50 lbs., @ 45c. per cwt.; 25 lbs. or less @ 50c. per cwt. Only about 300 tons of natural ice have been harvested here, while the factories have a capacity of 120 tons daily.

Peoria.—Clear Lake Ice Co., F. C. Carroll.: Prices, family trade, 10 lbs. four times per week, $1.25 per month; 10 lbs. daily, $1.75 per month; 20 lbs. daily, $2.50 per month. Coupon books, 30c. per cwt.; 100 to 400 lbs. delivered at one time, 20c. per cwt.; 500 lbs. or over, @ 15c. per cwt. At ice depots for butchers, brewers, etc., $2 to $3 per ton. For refrigerator cars and breweries, at ice house, $1.75 per ton; delivered, $2.50 per ton.

Springfield.—Pure Ice and Cold Storage Co.: Prices to families, 30c. per cwt.; to butchers and large consumers, 20c. per cwt. Wholesale price, $2.50 per ton. Only a limited quantity of natural ice was harvested, not enough for half the season's demand. Outlook fair; abundant competition by small dealers.

INDIANA.

Bloomington.—Home Ice Co.: Prices now and for the season are, $3, $4 and $5 per ton. Very little (150 tons) of natural ice was harvested here. The factories have a capacity of about 25 tons daily. Prospects for business in 1900 are very good.

Ft. Wayne.—C. R. Higgins Artificial Ice Co.: The present prices range from $2.25 to $2 in ton lots; 25c. to 20c. per cwt. for private consumers. These prices will probably rule for the year. About 10,000 tons of natural ice were housed at Warsaw, and 3,500 tons at Pleasant lake. None anywhere else in northeastern Indiana. None was stored here. The ice factories can manufacture about 150 tons per day. The outlook for ice business is good, but not at prices that dealers should get.

Indianapolis.—Indianapolis Ice Co.: Prices to families will be 20c. per 100 lbs.; to butchers and saloon keepers, 10c. and 12½c. per 100 lbs. About 30,000 tons of natural ice were stored in Indianapolis, and some 6,000 tons of manufactured ice is in storage. The ice factories have a total capacity of about 550 tons daily. Outlook for business this year is bad.

Kokomo.—J. M. Leach & Co.: Our prices will be same as last year, viz.: To families at rate of $8 per ton; to saloons, $4 per ton; to butchers, $3 per ton. Wholesale prices to heavy consumers, $2 per ton. The capacity of ice factories here about 25 tons daily.

Marion.—Marion Ice and Cold Storage Co.: Present prices for ice, $2.50 per ton for saloons and butcher shops; 20c. per cwt. to druggists, grocers, etc.; 40c. per cwt. to private families. About 3,000 tons of natural ice have been housed here. The capacity of the ice factories is about 40 tons per day. There is plenty of ice in this vicinity, and we anticipate no higher prices.

Muncie.—Muncie Ice Co.: Our prices for family trade will be 30c. to 35c. per cwt.; to saloon keepers and butchers, 15c. per cwt.; grocers and hotel keepers, 25c. per cwt. Wholesale, at factory, $2 per ton. Car lots at factory, $1.75 per ton. No natural ice of any consequence was stored here. Prospects for ice business good.

Richmond.—Independent Ice and Fuel Co.: Our prices are about same as last year, with a slight advance to those using less than 100 lbs. at one delivery. No natural ice at all. We think the outlook for our business very promising.

Terre Haute.—Vigo Ice and Cold Storage Co.: Prices at present and for the season at retail will be at the rate of $8 per ton. No natural ice stored here. Capacity of ice factories, 125 tons daily. Prospects good.

IOWA.

Des Moines.—Des Moines Ice and Cold Storage Co.: About 35,000 to 40,000 tons of natural ice have been harvested in this

vicinity. Everything is full, and ice will be plenty. Prices about same as last year, but will probably be a little higher later in the season.

Sioux City.—Pure Ice Co.: Our prices are, on average, delivery of 50 lbs. at 50c. per cwt.; 50 to 100 lbs. at 40c. per cwt.; 100 to 200 lbs., 35c. per cwt.; 200 to 400 lbs., 30c. per cwt.; over that, 25c. per cwt. Wholesale to butchers, in ton lots, 12½c. per cwt.; in ½-ton lots, 15c. per cwt.; 500 lbs. and under 1,000 lbs., 17½c.; under 500 lbs., 20c.; if less than 200 lbs. at one delivery, at rate of 22½c. per cwt. About 35,000 tons of natural ice have been stored. We anticipate much better business than last year, as prices are increased 25 to 50 per cent.

KANSAS.

Atchison.—Thomas Fuel and Ice. Co.: Prices for ice in car lots are $2 per ton for manufactured ice, and $1 to $1.50 per ton for natural ice. Probable prices for season, car lots, $3 per ton; less than car lots, $4 per ton. Retail prices: Wagon loads at plant, $4 per ton; to butchers, druggists, etc., 25c. per 100 lbs.; family trade, 10 lbs. daily, $1.50 per month; 20 lbs. per day, $2.40 per month; 30 to 50 lbs. per day, 35c. per 100 lbs.; over 50 lbs. daily, 30c. per 100 lbs. About 5,000 tons of natural ice was stored here, while adjacent towns have from 30 to 500 tons, according to requirements. Capacity of ice factories in this section, 125 tons daily. Much of the ice harvested was of inferior quality, and this, together with prospects for a large fruit crop, makes the outlook for trade good.

Fort Scott.—Fort Scott Ice Manufacturing Co.: Price list for 1900 is as follows: 7 lbs. per day, $2.50 per month; 10 lbs. per day, $3 per month; 15 lbs. per day, $3.50 per month; 20 to 30 lbs. each time, 60c. per cwt.; 40 to 100 lbs. each time, 50c. per cwt.; 200 to 300 lbs. each time, 40c. per cwt.; 400 to 1,500 lbs. each time, 35c. per cwt.; 2,000 or more each time, 25c. per cwt.

Fort Scott.—O'Connor & Hamlin: No natural ice was stored in this section. About 500 tons of manufactured ice on hand. Prices: 2,000 lbs. or more, at 25c. per cwt.; 1,000 down to 400 lbs., at 35c. per cwt.; 300 to 200 lbs., 40c. per cwt.; 100 to 50 lbs., 50c. per cwt.; 40 to 20 lbs., 60c. per cwt. These prices represent an advance of 5c. per cwt. on ton lots, and 50c. per month on family service, over the prices for 1899.

Topeka.—Topeka Ice and Cold Storage Co.: Prices at factory to retail dealers, $2.50 per ton. After April 1, $3.00 per ton. Wholesale prices during the season will undoubtedly reach $4 to $4.50. Retail rates not yet decided, but prices will reach at least 5c. per 100 lbs. above last year's card rates, which were 20c. to 50c. per cwt., according to quantity used. There is absolutely no natural ice stored here. Capacity of the four ice plants here is 80 tons daily.

KENTUCKY.

Frankfort.—Frankfort Ice Co.: Present prices for ice are, 25c. per cwt. in 100-lb. lots; 30c. per cwt. in 50-lb. lots; 35c. per cwt. in 25-lb. lots; less than 25 lbs., at the rate of 40c. per cwt. There is no natural ice stored here. Capacity of ice factories in our city is about 28 tons per day, but we have Lexington and Georgetown near by, where they have a capacity of 60 and 30 tons, respectively. In case of an accident we buy from them. We see no chance for improvement for the coming season. There is some talk of more opposition.

LOUISIANA.

Crowley.—Crowley Ice Factory: Prices rule from 40c. to 60c. per 100 lbs. at retail; from $3 to $3.50 per ton in car lots. No natural ice. Our factory makes 12 tons daily; at Lafayette 7 tons and Jennings 5 tons daily. Prospects for trade as good if not better than last year.

New Orleans.—Carrollton Ice Manufacturing Co.: Present prices for ice at the factories, 10c. per cwt. The wholesale price for the season will be at the factories 15c. per cwt. and 25c. per cwt. delivered to families, etc., or 20 lbs. for 5c. The capacity of all the factories when in operation is 975 tons daily. As will be seen by the above, the ice business is ruinous. Coal, ammonia and everything appertaining to the manufacture of ice went up from 25 to 30 per cent. A great deal of rivalry between the factories exists. Each one vies in cutting prices, and the consequence is—a great ice war. Our Mr. Lagardere has been living here the past thirty-five years, and never up to date has seen ice delivered at the above figures.

MARYLAND.

Cumberland.—Cumberland Ice Manufacturing Co.: There has been a large amount of natural ice harvested during the past winter, and it will make competition very strong in the ice business for the coming season. We look for very little trade in the wholesale line. We have not made prices for the coming season, but judge they will be the same as last year, viz.: Hotels, butchers and saloons, 20c. to 25c. per cwt.; family trade, 30c. and 40c. per cwt. Wholesale in car load lots, $2.50 per ton. Our capacity per day is 25 tons.

Hagerstown.—Hagerstown Ice Co.: Prices will rule about same as last year, to-wit: Less than 50 lbs., at 50c. per cwt.; 50 to 100 lbs. at 40c.; 100 to 200 lbs., 30c.; 200 to 300 lbs., 25c.; 300 lbs. and over, 20c. per cwt. Per ton at factory, $3.80 per ton; delivered, $4. Everybody who had a house filled it with natural ice.

Hagerstown.—Bester Ice Co.: Prices will rule same as last year. This section has stored about 2,000 tons natural ice. All of this will not compete with us in this trade. At present there is not more than 100 tons artificial ice on hand, but by May 1 there will be about 1,000 tons in storage. Capacity of the two plants here, 40 tons per day, 20 tons each. The other plant is the can system. Prospects for 1900 business are the best we have had for years.

Salisbury.—Salisbury Ice Manufacturing Co.: Prices will be $4 per ton in lots of one ton or over. Retail, same as last year. About 400 tons of natural ice stored here, which will have to be consumed before the machine ice will be wanted.

MISSOURI.

Malden.—Malden Ice Manufacturing Co.: Prices: Retail, 40c. to 60c. per cwt.; car lots, per ton, $3. Advance in wholesale rates of 25c. to 75c. per ton will be made. Very little natural ice stored here. Demand for ice is good, and all factories in this section will no doubt find ready market for their output. About 150 tons daily can be manufactured.

Mexico.—Crystal Ice Co.: Retail prices will be from 20c. to 50c. per cwt. Little natural ice, and that of a poor quality, housed. About 200 tons of ice daily can be manufactured in this and adjoining towns. Outlook fair to good.

Nevada.—Nevada Pure Ice Co.: Retail prices will be 25c. to 30c. per cwt. To large consumers at rate of $3.50 to $5 per ton. Car lots will range from $2.50 to $3.50 and $4 f. o. b. at Nevada. No natural ice. We make 20 tons daily.

Springfield.—Springfield Ice and Refrigerating Co.: Retail prices will be 40c., 50c., 60c. and 75c. per cwt. Wholesale, $3.50 per ton. No natural ice here.

St. Louis.—Creve Cœur Lake Ice Co.: There was no ice cut within 150 miles of St. Louis. We have about 2,000 tons daily of machine ice for the trade, which, along with the natural ice adjacent to this market, and the ice carried over from last season, amounting to about 75,000 tons, will take care of the wants of St. Louis. Prices, $2 to $2.50, wholesale; 20c. to 35c. per cwt., retail.

NEW ENGLAND STATES.

Bridgeport, Conn.—E. A. Upson: Present retail prices for ice range from 20c. to 40c. per 100 lbs. The probable summer prices, 25c. to 50c. The ice crop in Connecticut is about ¼ less than the average. We have a new ice factory going up, which will have a capacity of 50 tons daily. This, together with ice stored, will prevent any alarm as to scarcity or high prices.

New London, Conn.—W. R. Perry: There was no ice harvested in this vicinity, and same is true of Norwich, just north of us. My houses have about 1,200 tons of old ice. Old stock equal to about two-thirds of amount sold last year. Ice 26 inches thick, planed down to 16 inches is now (March 26) being cut at West Ridge, N. H., some of which will probably come down here. At the Connecticut ice dealers' convention on the 22nd, it was shown that the shore towns were all short of ice. Some places had the usual supply, and some a surplus, but it was the general opinion that all the ice on hand would be called for, and that prices would rule higher.

Auburn, Me.—Bearce, Wilson & Co.: About 20,000 tons harvested in this section—a little more than last year. Crop is about all sold in this market, but we shall have some to ship in car load lots next fall.

Haley, Me.—American Ice Co.: At this point we have harvested about 1,500 tons, and have 1,800 tons in the houses. About 50 per cent of an average crop harvested. Cannot state what prices will be, probably about double what they were last year.

Rockport, Me.—Rockport Ice Co.: We have harvested about 30,000 tons, as good but not as heavy as last year's crop. Amount harvested is about three-fourths of an average crop. Amount in other houses here, about 20,000 tons. Our business is wholesale for shipment to foreign and Atlantic ports.

Lynn, Mass.—Lynn Ice Co.: We have harvested about 27,500 tons, and the total crop stored in this section is about 50,000 tons. Quality is good, but about two inches thinner than last year's crop. The chances are that prices will be changed from last year's prices.

North Adams, Mass.—People's Ice Co.: Have harvested about 20,000 tons of exceptionally good ice. Total crop last year, about 15,000 tons. Prices will probably be $2.50 per ton wholesale and $5 per ton retail.

Springfield, Mass.—Prices here will range about the same as in 1898, *i. e.*, for family use, 25c. to 30c. per 100 lbs.; larger users, 20c. per 100. Wholesale to market, etc., from 10c. to 15c. per 100 lbs.

Westfield, Mass.—Spring Water Ice Co.: About 8,000 tons harvested here, better quality than last year. There are 13,000 tons in storage here, more than the average. Prices for family trade, 20c. to 33c. per cwt. Hotels, markets, etc., 12½c. per cwt.

Manchester, N. H.—Notices of advance in rates have been sent out. The wholesale price quoted as high as $6 per ton. Retail prices advanced about 75 per cent.

NEW JERSEY.

Paterson.—Paterson Consolidated Ice Co.: Retail prices for season not yet fixed. Probably prices about $5 to $8 per ton, retail. About 20,000 tons of natural ice stored here; capacity of ice factories, 60 tons daily. Outlook is fair; the demand much greater than the supply.

NEW YORK.

Jamestown.—Lakewood Ice Co.: About 85,000 tons of ice harvested in this section, of excellent quality; 175,000 tons in all the houses. Full harvest. Probably 80,000 or 90,000 tons were carried over from last year. We do not anticipate much advance in prices over last year.

New York.—New York used approximately 2,000,000 tons of ice last summer, the bulk of which came from the Hudson. This year there has been little or none stored on the Hudson. The price last year was 20c. per cwt. It now retails for 25c. to 30c. per cwt. In 1890 ice sold in New York at 1c. per lb., and it is feared that prices may reach a very high figure during the present season.

Oneida.—Bennett & Klock: Wholesale price of ice, $2 per ton. Retail, 10 lbs. daily, 35c. per week; 20 lbs., 50c.; 30 lbs., 60c.; 100 lbs. or over, at 25c. per cwt. About 3,000 tons of ice were harvested here, and about 6,000 tons are now in the houses, which is a full supply.

Syracuse.—People's Ice Co.: Family rates, taking 25 to 50 lbs., at 30c. per cwt.; 50 to 100 lbs., 25c. per cwt.; 400 lbs. or over, 20c. per cwt. Wholesale, 100 to 500 lbs. at one delivery, at 15c. per cwt.; 500 to 1,000 lbs., 12½c. per cwt.; 2,000 lbs. and over, at 10c. per cwt. About 60,000 tons were harvested and 30,000 tons carried over. The harvest was a full one. The 60,000 tons harvested this year are free from any snow ice, and the ice is from 8 to 12 inches in thickness, it all being gathered before February 20, 1900. The price list this season is about the same as last year's.

Wayville—Charles W. Ferris: Harvested about 4,000 tons of good ice. There are about 100,000 tons in the houses here. All the ice harvested in this section is for New York market, and there seems to be no general price, although there are several good standing offers. We are expecting good prices.

NORTH CAROLINA.

Wilmington.—Wm. E. Worth & Co.: We are selling at 25c. per 100 lbs. in lots of from 25 to 500 lbs. By the ton, $3 to $4. Ice tickets: 10 lb. tickets, 30c. per 100; 25 to 100-lb tickets, 25c. per 100. The chances are prices will be lower, as we have an ice war here. We have storage for 3,000 tons, and have 2,600 tons on hand. The ice factories in the city have a capacity of 90 tons daily. There is capacity to make twice as much ice as can possibly be used in the hottest weather.

OKLAHOMA.

El Reno—El Reno Ice and Coal Co.: Wholesale prices here will be, in car lots, from $2.75 to $4 per ton; retail, delivered to creameries, cold stores, breweries, etc., in lots of 500 lbs. or over, at 25c. per cwt.; to butchers, 40c. per cwt.; to families and others taking 50 lbs or over, 50c. per cwt. No natural ice here. Estimated output of factories, here and in Indian territory, about 400 tons daily. About 4,000 tons, or thereabouts, is now in storage.

OHIO.

Columbus.—Columbus Ice Co.: Family rates, taking 10 lbs. daily, $2 per month; 15 lbs. daily, $2.50; 20 lbs. daily, $2.75; 25 lbs. daily, $3; 25 to 100 lbs., 40c. per cwt.; 100 lbs. or more, 35c. per cwt. In ton lots, taking 4 to 7 tons, at $2.50 per ton; 1 to 4 tons at $3 per ton; 1,000 to 2,000 lbs., 17½c. per cwt.; 500 to 1,000 lbs., 20c. per cwt.; 100 to 500 lbs., 25c. per cwt. About 80,000 tons of natural ice were stored in this section. The ice factories have a capacity of 225 tons per day. The prospects for 1900 are for an average season.

Columbus.—Crystal Ice Manufacturing and Cold Storage Co.: Retail prices for 25 lbs. to 100 lbs., 40c. per cwt.; 100 lbs. or over at one delivery, 35c. per cwt. Coupon books sold at face value only. The rates are same as last year, and bid fair for the coming season.

Dayton.—Dayton Ice Manufacturing and Cold Storage Co.: Prices from April 1, 1900, will range as follows: 3,500 to 5,000 lbs. at $3 per ton; 5,000 lbs. to 20 tons at $2.50 per ton; 10 tons or over, $2.25 per ton. Retail, 10 lbs., 5c.; 20 lbs., 10c.; 50 lbs., 15c.; 70 lbs., 20c.; 100 lbs. and less than 300 lbs., 25c. per 100 lbs.; 300 lbs. and over, 20c. per 100 lbs. An average crop was harvested, and outlook is fair.

Youngstown.—Crystal Ice and Cold Storage Co.: Prices for past year were: For 2,000 lbs. or over, 15c. per cwt.; for 1,200 to 2,000 lbs., 17½c. per cwt.; for 400 to 1,200 lbs., 20c. per cwt.; for 200 to 400 lbs., 25c. per cwt. Smaller lots at from 30c. to 50c. per cwt. This year prices will be from 5 to 10 per cent higher than last. Amount of natural ice stored in our section is from 6,000 to 8,000 tons. Ours is the only factory in this district; its capacity is 30 tons. The outlook for the ice business this season is very encouraging.

PENNSYLVANIA.

Erie.—Consumers Ice and Cold Storage Co.: About 10,000 tons of natural ice was housed here, but of poor quality. This is about one-third above the average crop. Average cutting in this section runs about eight inches. Last cutting ran up to about sixteen inches, but of rather poor quality, as it is mostly snow ice, porous and white. Prices, wholesale: 150 lbs. or less, 25c. per cwt.; 150 to 450 lbs., 20c. per cwt.; 450 to 900 lbs., 15c. per cwt.; 900 lbs. and over, 12½c. per cwt. Retail: 50 lbs., one delivery, 20c.; 50 to 100 lbs. at 30c. per cwt.; not less than 200, four deliveries per week, 25c. per cwt.

Easton.—Easton Ice Co.: Prices for season of 1900 are as follows: 5 lbs. daily, 35c.; 10 lbs. daily, 53c.; 20 lbs. daily, 70c.; 25 to 50 lbs., at rate of 40c. per cwt.; 50 to 100 lbs., at rate of 25c. per cwt.; wholesale price at house, $2 per ton. We have stored about 4,000 tons this year, being 1,500 tons more than last year—quality equally as good. Total amount harvested in this section, about 7,500 tons—about 60 per cent of the average crop.

Harrisburg.—Hygienic Ice Co.: About 58,000 tons of natural ice is stored in houses here. Capacity of ice factories, 75 tons daily. Prices for 1900: Wholesale, $4 per ton; 2 tons or over at rate of $3.50 per ton. Retail, 10 lbs. daily, per week, 35c.; 20 lbs. daily, per week, 70c.; 50 to 100 lbs., at 40c. per 100 lbs.; 100 to 200 lbs., at 30c. per 100 lbs.; 200 to 2,000 lbs., at 25c. per 100 lbs.

Ogontz.—Wm. H. Shoemaker: Very little ice stored in this neighborhood. Prices are: 8 lbs. daily, 35c. per week; 12 lbs., 45c.; 16 lbs., 55c.; 20 lbs., 63c.; 25 lbs., 70c.; 40 to 100 lbs., at rate of 40c. per cwt.; 200 lbs. or over, 20c. per cwt. at houses.

RHODE ISLAND.

Providence.—Earl Carpenter & Sons: Prices for 1900, 12 lbs. daily, 60c. per week; 15 lbs., 72c.; 18 lbs., 84c.; 22 lbs., 96c.; 26 lbs., $1.08; 30 lbs., $1.20. A 50-lb. chunk costs 25c. This is an increase of over 50 per cent on last year's prices.

Westerly.—It is expected that the wholesale price of ice here will not fall much below $6 per ton. Last year the retail price was 40c. per cwt. This year so far the prospects are that it will be 80c. per cwt.

SOUTH CAROLINA.

Columbia.—Palmetto Ice Co.: Our prices are: 25c. per 100 lbs., the same as last year. The capacity of factories is 50 tons daily.

TENNESSEE.

Jackson.—Tennessee Ice and Cold Storage Co.: Prices for ice to saloons and butchers will be 25c. per cwt.; to families, 35c. and 40c. per cwt. Wholesale prices, $3 to $3.50 per ton. Daily capacity of ice plants here, 45 tons. There are plants in nearly all surrounding towns.

Knoxville.—Crystal Ice Co.: Wholesale prices for ice will be about same as last year, to wit: $4 to $5 per ton at factory. Retail prices not yet fixed. Little or no natural ice is stored here. There are two factories here, with a total daily capacity of 76 tons.

TEXAS.

Beaumont.—Beaumont Ice, Light and Refrigerating Co.: Wholesale prices for ice here will be $2.50 to $3 per ton. No natural ice. Capacity of factory, 75 tons daily. Outlook for ice business very good.

Sherman.—Sherman Ice Co.: Wholesale prices for ice here will be $3.50 per ton in car lots; $5 to $6 per ton in ton lots at factory. Retail, 40c. per cwt. in 100-lb. lots; 50c. per cwt. in smaller quantities. This is an advance of 50c. per ton in car load lots. The capacity of all plants here is about 150 to 175 tons daily. The outlook for ice business is good.

Temple.—Temple Cold Storage and Ice Factory: We are selling ice, wholesale, car load lots at $3 per ton, f.o.b. our platform. Retail, 60c. per cwt., delivered in ice boxes. Our country is in fine shape, and the outlook for a good ice season is very flattering.

VIRGINIA.

Norfolk.—Tidewater Ice Co.: Prices for ice are about the same as last year. There is no natural ice stored in this city, but with abundance of manufactured ice and plenty of machines to make it, the tendency will be to lower prices. As to the capacity of all the machines in this section, we have in this city machines with a capacity of 235 tons daily, in Portsmouth, a 50-ton plant and three natural ice dealers; in fact the whole business is overdone, and unless steps are taken to control the output, it looks as if the people will get very cheap ice in the near future.

Richmond.—Richmond Ice Co.: Retail prices for ice, delivered, not less than 100 lbs. at one delivery, 40c. per cwt.; less than 100 lbs., 50c. per cwt. We have practically given up handling natural ice, as cost of transportation from Maine makes this too expensive. Our output is sold at retail by the Mutual Ice Delivery Co.

WEST VIRGINIA.

Charleston.—Diamond Ice and Coal Co.: Prices for ice in car load lots, $1.50 to $2. To saloons, 30c. to 35c. per cwt.; for family trade, 40c. to 50c. per cwt. No natural ice stored here. Capacity of ice machines, 40 tons daily.

Parkersburg.—Parkersburg Ice Co.: Retail prices of ice for family trade are as follows: 10 to 100 at one delivery, 50c. per cwt.; 100 at one delivery, 40c. per cwt. Saloons, hotels, restaurants, soda fountains, 20c. to 35c. per cwt., depending on the quantity consumed. Wholesale, $1.50 to $2 per ton. The above prices are a trifle lower than last season's prices. There is considerable natural ice in storage in this section, and it will "cut some ice" in the manufacturers' trade this summer. We do not carry any ice in storage, as we have ample capacity to take care of our trade at all times, except in case of breakdown. Taking it all in all, the outlook for trade in this section is not as bright as it was a year ago, and we do not look for the rush that we had last year.

——The Vilter Manufacturing Co., of Milwaukee, Wis., reports having recently sold to the Ruemmeli & Siebert Refrigerating Machine Co., of St. Louis, Mo., one 75-ton, one 50-ton and one 40-ton refrigerating machine.

——The Hygeia Ice and Cold Storage Co., at North Adams, Mass., is the name of the new company mentioned in the February issue of ICE AND REFRIGERATION as building a new ice making and cold storage plant. The company has a capital of $20,000. The directors are: H. W. Clark, V. A. Whitaker, H. W. Tinker, Charles E. Whitney, James E. Hunter, George B. Perry and T. W. Sykes.

THE following memoranda of projected ice factories and refrigerating plants, or of those in course of construction, and of improvements and betterments in existing plants, have come to our notice during the past month:

ALABAMA.

Eufaula.—The Eufaula Oil and Fertilizer Co. is having its plant equipped with a new 6-ton ice machine, by the Frick Co., of Waynesboro, Pa.

ALASKA.

Dawson.—The Pacific Cold Storage Co., of Tacoma, Wash., which operates a cold storage plant here, is preparing, it is stated, to erect additional cold storage plants at Nome, Valdes, Rampart City and St. Michael, and possibly at other points in the far northwest. A 3-ton plant is already on the ground at Nome.

ARIZONA.

Yuma.—P. B. Hodges is preparing to equip his meat market with a refrigerating plant, and has contracted with parties from Los Angeles, Cal., for a machine, to cost $2,500.

ARKANSAS.

Conway.—Allinder & McCulloch contemplate the erection of a 6-ton ice making plant, and want estimates on machinery.

Hot Springs.—C. G. Converse is erecting a cold storage warehouse here and will equip same with a 6-ton refrigerating plant, the machinery for which will be supplied by the A. H. Barber Manufacturing Co., of Chicago.

Paragould.—The Paragould Compress Co. are in the market for a 25-ton ice machine.

Van Buren.—It is reported that a number of citizens have expressed a desire to take stock in a company which will build and operate an ice making plant.

CALIFORNIA.

Corning.—W. H. Morrisey, of Orland, is preparing to erect a meat market and cold storage plant here.

Fresno.—The Fresno Brewing Co., Ernst Eilert, manager, is erecting a new brewing plant, and has decided to equip same with a 25-ton Linde refrigerating machine, to be supplied by the Fred W. Wolf Co., of Chicago.

Mariposa.—W. N. Ten Eyck intends to erect an ice making plant here in the near future.

FLORIDA.

Apalachicola.—The Apalachicola Water Works Co. asks for bids on a 5-ton ice making plant, new or second-hand.

Carrabelle.—The Carrabelle Packing Co., wholesale fish dealers, are erecting a building 34×38 feet in size, and will equip same with a 3-ton ice making plant supplied by the Columbus Iron Works, of Columbus, Ga.

Riverside.—The Crystal Ice Co.'s plant has passed under control of Mr. F. G. Russell, who has had it thoroughly overhauled and will add, it is stated, a new ice machine, engine, etc.

Tampa.—A site for a new ice factory has been purchased by parties from Montgomery and Dothan, Ala., Wm. R. Moore, manager, who will build and operate a 30-ton plant. Contract for the machinery has been awarded to the Henry Vogt Machine Co., of Louisville, Ky.

GEORGIA.

Atlanta.—A new ice making plant is to be erected here by the agencies of the Armour, Swift, Hammond, Cudahy and Swartzschild & Sulzberger packing companies. A plant of fifty tons capacity is proposed, the product to be used for the needs of the houses concerned.

Blackshear.—The A. P. Bentley Co. contemplate putting in a small ice making plant, and are securing bids on machinery.

Dublin.—The Dublin Oil Mill and Ice Factory is equipping its plant with a new 6-ton ice machine, increasing its former capacity of five tons to eleven tons. The improved plant is to be ready for operation in May next.

IDAHO.

Boise.—The Boise Butcher Co. has decided to construct a modern cold storage apartment and equip same with a refrigerating machine.

ILLINOIS.

Canton.—The Parlin & Orendorff Co. has decided to equip its plant with a 30-ton ice making and refrigerating machine, and will make ice for its own use only.

Chicago.—The Union Cold Storage Co. has had plans prepared for an extensive addition to its plant, which calls for a building to cost about $400,000. The plans provide for the construction of the new portion in sections, and it is intended to build only a portion of the structure this year.

Chicago.—W. J. Moxley is preparing to improve the cooling chambers in his butterine factory, and will put in an additional 25-ton De La Vergne refrigerating machine.

Clinton.—The Clinton Ice Manufacturing Co. is erecting a plant for the manufacture of ice, and has contracted with the A. H. Barber Manufacturing Co., of Chicago, for a 10-ton ice machine.

Sidell.—The Sidell Electric Light and Cold Storage Co., who are erecting an ice factory and electric lighting plant, as mentioned in the March issue of ICE AND REFRIGERATION, have contracted with the Henry Vogt Machine Co., of Louisville, Ky., for a 10-ton refrigerating machine, and also for boilers for the electric light plant.

IOWA.

Des Moines.—The Savery Hotel Co. has decided to cool its premises next summer by means of a refrigerating machine, and has already awarded contract for the installation of a 7-ton machine to the A. H. Barber Manufacturing Co., of Chicago.

KANSAS.

Galena.—Morris & Butt, of Kansas City, Mo., have purchased a site here, and will erect thereon the cold storage plant first intended for Empire City, as mentioned in last month's issue of ICE AND REFRIGERATION.

Galena.—It is reported that Messrs. Wood and Harris, representing an eastern syndicate, have decided to erect here a cold storage plant to cost about $50,000.

Newton.—It is reported that the management of the Atchison, Topeka & Santa Fe R. R. Co. has decided to construct here a plant for the manufacture of ice, to supply its various western stations, cars, etc. A cold storage room is also to be added. A plant to cost about $30,000 is proposed.

Topeka.—It is reported that a cold storage plant, to cost $50,000, is to be erected here some time in the near future by outside capitalists. The matter, however, seems to be still indefinite and uncertain.

Wichita.—The Citizens' Ice Co., Messrs. Steffen and Bretch, proprietors, are enlarging their plant, built less than a year ago, to double its former capacity. A second 20-ton absorption machine, to be supplied by the Ice and Cold Machine Co., of St. Louis, Mo., will be installed. Work on the improvement was begun March 1, and is to be completed by May 15.

KENTUCKY.

Bowling Green.—Cooke & Hagerman are erecting a cold storage room for meats, game, etc.

Fulton.—It is reported that parties from New Orleans are preparing to build and operate an ice making plant here.

Henderson.—Messrs. Kleymeyer & Klute contemplate the erection of an ice making and cold storage plant in this city.

Louisville.—The Louisville Cold Storage Co. is preparing to improve and enlarge its plant, and has already contracted with the Henry Vogt Machine Co., for a 50-ton ice machine.

Louisville.—It is reported that the Armour Packing Co., of Kansas City, will erect a cold storage warehouse here in the near future, to cost about $50,000. The report is denied at the headquarters of the Armour Co.

Owensboro.—Henry D. Fitch, mentioned in last month's issue of ICE AND REFRIGERATION, as having decided to put in an ice machine, has organized the People's Ice and Cold Storage Co., who will build an ice and cold storage plant here. Contract for a 45-ton refrigerating machine has been made with the Henry Vogt Machine Co., of Louisville.

Somerset.—J. P. Hornaday, representing Cincinnati and local capitalists who propose to build an electric light and ice making plant, asks for bids on ice making machinery.

LOUISIANA.

Boyce.—J. E. Blackburn, mentioned in the March issue of ICE AND REFRIGERATION as in the market for ice making machinery, has since contracted with the Henry Vogt Machine Co., of Louisville, for one of their standard 8-ton ice making machines.

Patterson.—The Patterson Ice Manufacturing and Supply Co. is enlarging its plant, and will put in a 6-ton ice making machine, to be supplied by the Frick Co., of Waynesboro, Pa.

MAINE.

Portland.—A project is under way for the erection here of a large cold storage warehouse, to be provided with mechanical refrigeration, and especially arranged for storage of dressed beef and other food products.

MARYLAND.

Baltimore.—G. W. Gengnagel is preparing to equip his wholesale meat market with refrigerating machinery, and has contracted with the A. H. Barber Manufacturing Co., of Chicago, for a 10-ton plant, complete.

Cumberland.—The Allegany county almhouse and asylum is to be provided with a cold storage house, 31×42 feet in size, plans for which are being completed by Architects Jacobs & Saulsbury, of this city.

MASSACHUSETTS.

Fall River.—The Hygeian Ice and Cold Storage Co., recently organized here by Messrs. Mackenzie & Winslow, as mentioned in the March issue of ICE AND REFRIGERATION, has awarded contracts to the Starr Engineering Co., of New York, for the installation of a 25-ton ice making plant. The company, has also purchased the Mackenzie-Winslow Co.'s cold storage warehouse on Davol street, and will enlarge same and operate it. The 25-ton ice machine for the new plant is to be supplied by the Pennsylvania Iron Works Co., of Philadelphia.

Gloucester.—Geo. J. Tarr & Co. will equip their cold storage warehouse with a 10-ton refrigerating machine, to be supplied by the A. H. Barber Manufacturing Co., of Chicago.

Lowell.—E. M. Slayton & Co., proprietors of the cold storage warehouse at Lawrence, have opened, it is stated, a branch warehouse here, and will equip same with a 5-ton Vilter refrigerating machine, complete.

Worcester.—The Cudahy Packing Co. will equip its wholesale meat market here with a 12-ton refrigerating machine, contract for which has been awarded to the A. H. Barber Manufacturing Co., of Chicago.

MEXICO.

La Colorado, Sonora.—The new ice making plant erected here was built by Walter R. Wilcox, instead of Geo. Wilcox, as mentioned in the February issue of ICE AND REFRIGERATION. A 3-ton machine, supplied by H. E. Harris, of Oregon City, Ore., has been put in.

MICHIGAN.

Detroit.—The Fallis Market Co. are erecting a market building, 33×45 feet in size, and will cool their meat boxes by means of an 18-ton refrigerating plant, consisting of one 12-ton and one 6-ton compressor, direct expansion system, supplied by Kroeschell Bros. Ice Machine Co., of Chicago.

Lake Linden.—The Bosch Brewing Co. is improving its storage house, and is having installed, by the Vilter Manufacturing Co., of Milwaukee, a 35-ton refrigerating machine.

Menominee.—Penberthy Cook & Co. have commenced the construction of a cold storage warehouse on their dock property. The building will be 50×100 feet in size, two stories high, and equipped for the storage of fruits and produce.

MINNESOTA.

Mankato.—The Standard Brewing Co. has decided to improve its plant by substituting mechanical refrigeration for ice in its storage department, and is having a 25-ton refrigerating machine installed by the Vilter Manufacturing Co., of Milwaukee, Wis.

MISSISSIPPI.

Corinth.—The Corinth Compress Co., F. L. Green, superintendent, is in the market for a small ice machine, and desires bids from manufacturers.

Lexington.—The Lexington Ice, Light and Water Co. is extending its plant, and will put in a 4-ton ice machine, to be installed by the Frick Co., of Waynesboro, Pa.

Starkville.—The Starkville Cotton Oil Co. has been organized here with $30,000 capital, to build and operate a cotton seed oil mill and ice making plant.

Winona.—The Winona Ice and Electric Light Co., mentioned in the February issue of ICE AND REFRIGERATION, has completed organization, and has commenced construction on a 20-ton ice making plant, to be completed by June 15, 1900. The machinery is to be supplied by the De La Vergne Refrigerating Machine Co., of New York.

MISSOURI.

Butler.—It is reported that a plant for the manufacture of ice will be erected here shortly.

Kansas City.—The Kansas City Ice and Cold Storage Co. is further enlarging its plant, and has contracted with the Vilter Manufacturing Co., of Milwaukee, Wis., for a 200-ton refrigerating plant, complete.

Kansas City.—Messrs. Morris & Butt, packers, are in the market for a full set of machinery for a packing house in Chihuahua, Mexico. Machinery for refining lard, for sausage and oleomargarine departments, and for pork and beef house, is wanted.

Lexington.—The ice and cold storage plant of Ernest Hoffman is being enlarged, and a new 25-ton refrigerating machine is to be put in, contract for which has been awarded to the Henry Vogt Machine Co., of Louisville, Ky.

Neosho.—The Neosho Ice Co. has been organized to build and operate an ice making, electric lighting and cold storage plant. The first board of directors include A. Ruemmeli and A. Nicoud, of St. Louis, and Ed. and Chas. Haas, of Neosho. The capital stock is $30,000. Construction of the plant is under way, and is to be completed about June 1. The machinery will be supplied by the Ruemmeli & Siebert Refrigerating Machine Co., of St. Louis.

Neosho.—G. F. C. Corl and Chas. H. Murray, under the firm name of Corl & Murray, are building an ice making plant here, as mentioned in last month's issue of ICE AND REFRIGERATION. The building will be 46×100 feet in size, and be equipped with a 20-ton ice machine, supplied by the Frick Co., of Waynesboro, Pa. Cold storage facilities will also be added. The plant is to be complete and up-to-date in all respects.

St. Joseph.—G. W. Chase & Sons, wholesale grocers, are having a 3-ton refrigerating machine installed for cooling their chocolate rooms, by the A. H. Barber Manufacturing Co., of Chicago.

St. Joseph.—The Cudahy Packing Co., of Omaha, is making preparations to build a cold storage plant, to cost about $20,000, at the corner of Fourth and Sylvanie streets.

St. Louis.—The St. Louis Refrigerating and Cold Storage Co., who are constructing the pipe line system here, as described in ICE AND REFRIGERATION for September, 1899, are about to put in another 100-ton refrigerating machine, which is to be supplied by the Henry Vogt Machine Co., of Louisville, Ky.

NEW JERSEY.

Boonton.—Eben C. Lyon, ice dealer, is erecting a plant for the manufacture of ice, and equipping same with a 5-ton absorption machine. The plant is to be ready for operation by May 1, 1900.

Camden.—The West Jersey Ice Manufacturing Co. is enlarging its plant from 60 tons to 75 tons daily capacity, the machinery to be supplied by the De La Vergne Refrigerating Machine Co., of New York.

Hoboken.—The General Refrigeration Co. has been organized by Thos. C. Wood, L. F. King, Ed. H. Wilson and others, the object being to build and operate a cold storage warehouse.

Passaic.—It is reported that Mr. Sheppard Knapp, of New York city, will build a plant for the manufacture of ice here in the near future.

Passaic.—The Passaic Beef Co. are enlarging their meat storage rooms and will equip same with a 25-ton De La Vergne refrigerating machine.

NEW YORK.

Islip, L. I.—The Islip Hygeia Ice Co. has been organized by Caleb T. Smith and others. The company is preparing to erect an ice making plant at the head of Suffolk road, East Islip. Contract for the ice machine has already been made with the De La Vergne Refrigerating Machine Co., of New York. The company has a capital of $15,000. F. S. Whitman is president, Frank Parker, secretary, and Caleb T. Smith, treasurer.

Larchmont.—J. T. Goodliffe has commenced the construction of a new plant for the manufacture of ice. It is to be ready for business about June 1. The buildings will be 40×107 feet in size, and will be equipped with a 20-ton ice machine, to be supplied by the De La Vergne Refrigerating Co. of New York.

New York.—The Manhattan Hygeia Ice Co., of 425 West Twenty-fifth street, is making preparations to increase the capacity of its plant by the addition of machinery to make 150 tons of ice daily.

New York.—The new 130-ton ice making plant, to be erected by Leonhard Michel and associates, as mentioned in the February issue of ICE AND REFRIGERATION, will be erected at the corner of Bond and Third streets, and be operated by a company to be known as the Empire City Hygeia Ice Co. It is expected that cold storage facilities will be added in the near future.

Port Jefferson.—Arrangements are under way for the organization of a company to build and operate a plant for the manufacture of ice.

Port Jervis.—The Deer Park brewery at this place is improving its plant by the addition of a 50-ton refrigerating machine, direct expansion piping, two 125-horse power return tubular boilers, etc., all to be supplied by the Frick Co., of Waynesboro, Pa.

Rochester.—The American Brewing Co. is improving its plant by the installation of a new 75-ton De La Vergne refrigerating machine.

Syracuse.—Kingan & Co. are having their meat storage rooms equipped with a 15-ton refrigerating machine by the De La Vergne Refrigerating Machine Co., of New York.

NORTH CAROLINA.

Greeneville.—R. Greene, of the Flanagan Buggy Co., is asking bids on the machinery for a 3 to 5-ton ice making plant, complete. The new plant is to be complete and ready for operation by June 15.

Hamlet.—The Hamlet Ice Co., recently organized, is building a plant which is to be equipped with a 25-ton ice machine. The plant is to be ready for operation by May 1. T. M. Rose, of Fayetteville, is to be the manager. It is proposed to build branch ice making plants or cold storage rooms in different parts of the state later on.

Winston-Salem.—The Winston-Salem Railway and Electric Co. is building a plant for the manufacture of ice, and has contracted with the De La Vergne Refrigerating Machine Co., of New York, for a 30-ton ice machine. The plant is to be ready for operation by June 1, 1900. H. E. Fries is president of the company, and F. A. Bau, manager.

OHIO.

Bridgeport.—Koehnline Bros., ice manufacturers, are enlarging their plant, and have contracted with the Vilter Manu-

facturing Co., of Milwaukee, Wis., for a 20-ton ice making machine.

East Liverpool.—The Crockery City Brewing Co. has decided to equip its new brewery with a 35-ton Linde refrigerating plant, complete, which will be installed by the Fred W. Wolf Co., of Chicago.

Hillsboro.—The Hillsboro Ice Co., has been organized by Lyman Beecher and G. B. Beecher, and is now building an ice making and cold storage plant. Contracts for a 35-ton Linde refrigerating machine and a complete 10-ton ice making plant have already been awarded to the Fred W. Wolf, of Chicago.

Marion.—F. C. Close, of Bellevue, contemplates erecting an ice making and cold storage plant here in the near future.

Portsmouth.—Sam T. Kenyon, W. R. Kinney, J. Stockham and others are planning to erect a large cold storage warehouse for storage of fruits, vegetables, etc., this spring.

OKLAHOMA.

Stillwater.—The Lahman-Keiser Co. has been organized by S. W. Keiser, president of the State bank, and Chas. E. Lahman; the latter being secretary and treasurer, the former vice-president, while F. E. Lahman, of Chicago, is president. The new company is building a plant for the manufacture of ice and has already contracted for a 25-ton Linde ice refrigerating machine and a 10-ton ice plant, complete, which will be supplied by the Fred W. Wolf Co., of Chicago.

Stillwater.—Messrs. Abercrombie and Miller, the cold storage warehousemen, are putting in an ice making plant, and have contracted with the A. H. Barber Manufacturing Co., of Chicago, for a 7-ton ice machine. A 100-horse power Corliss engine is also to be installed.

PENNSYLVANIA.

Allegheny.—The directors of the Pittsburgh Ice Co. contemplate the erection of an ice making plant here, to have a capacity of 100 tons daily, at a cost approximating $150,000. Options have been secured on desirable sites, and an early decision is expected.

Berwyn.—A new plant for the manufacture of ice is being erected here.

Erie.—The Erie Brewing Co. has decided to improve its branch plant at Sixth and Parade streets by putting in a 50-ton refrigerating machine, contract for which has been made with the Jarecki Manufacturing Co., of this city.

Philadelphia.—John Fritsch & Sons, brewers, are about to equip their plant with a second 50-ton refrigerating machine; this, as well as the former, supplied by the Vilter Manufacturing Co., of Milwaukee, Wis.

Philadelphia.—The A. Berg Glue Co. have decided to maintain low temperatures in their works next season by means of a 10-ton refrigerating plant, to be installed by the Vilter Manufacturing Co., of Milwaukee.

Philadelphia.—Weisbrod & Hess, brewers, have enlarged their storage capacity and otherwise improved their plant, and are now having installed by the Vilter Manufacturing Co., of Milwaukee, an additional 100-ton refrigerating machine.

Sharon Hill.—Elwood H. James & Son, sausage manufacturers, have commenced the construction of a cold storage warehouse, 50×70 feet in size, and will also engage in the manufacture of ice. A 50-ton Frick refrigerating machine, with thirty tons ice making capacity, is being installed.

Uwchland.—The Fairmount Creamery Co. is preparing to equip its plant with a refrigerating machine.

TENNESSEE.

Chattanooga.—J. F. Valodin is organizing a company here, it is stated, for the purpose of building and operating a plant for the manufacture of ice.

Clarksville.—Kleenan & Co. have decided to equip their meat market with a 3-ton refrigerating machine, to be supplied by the A. H. Barber Manufacturing Co., of Chicago.

Clarksville.—The Purity Milk and Creamery Co., Frank S. Beaumont, secretary, contemplates the erection of a cold storage plant, and desires figures from manufacturers of refrigerating machinery.

Columbia.—J. B. McLemore contemplates erecting an ice and cold storage plant here, and desires estimates and information.

Tullahoma.—The Tullahoma Electric Light and Ice Co., mentioned in last month's issue of ICE AND REFRIGERATION, will equip its new plant with a 10-ton ice machine, to be supplied by the Frick Co., of Waynesboro, Pa.

TEXAS.

Beaumont.—The Beaumont Ice, Light and Refrigerating Co. is improving its plant by the installation of two new 75-ton boilers, and is also putting in a new ice tank with a capacity of forty tons daily.

Corsicana.—The Corsicana Ice Co. is enlarging its plant, and will put in new machinery at a cost of about $2,000.

Frost.—D. B. Bennett & Son are building a plant for the manufacture of ice, and have contracted with the A. H. Barber Manufacturing Co., of Chicago, Ill., for a 4-ton ice machine.

Nogales.—The Nogales Electric Light, Ice and Water Co. are erecting a plant for the manufacture of ice, and have contracted for an 8-ton ice machine with the Vilter Manufacturing Co., of Milwaukee.

Rockdale.—A new ice making plant is being erected here by Mr. C. H. Coffield. Contracts have already been let for a 15-ton ice machine with the Frick Co., of Waynesboro, Pa. Plant is to be ready for operation in May, 1900.

Schulenburg.—A company is being organized by Mr. Anderson, formerly of Austin, to build and operate an electric light, ice making and cold storage plant.

UTAH.

Salt Lake City.—The Mountain Ice Co., recently reorganized, with J. D. Wood as president, and F. A. Stearns, secretary, has decided to improve its plant by the addition of a 50-ton ice regealed ice machine, to be supplied by D. L. Holden, of New York.

VIRGINIA.

Danville.—The Crystal Ice and Power Co., D. A. Overby, president, has been organized to build an ice factory of twenty-five tons daily capacity, and has contracted with the Frick Co., of Waynesboro, Pa., for the necessary machinery.

Onancock.—The Drummondtown and Onancock Electric Light and Power Co., J. P. L. Hopkins, president, proposes to erect and operate an ice making plant in the near future.

WASHINGTON.

Olympia.—The Capital Brewing Co. to increase its ice making capacity is preparing to put in an additional 8-ton ice tank and a 35-ton refrigerating machine, both to be supplied by the Vilter Manufacturing Co., of Milwaukee, Wis.

WISCONSIN.

La Crosse.—The La Crosse Plow Co. is preparing to equip its works with a brine cooler for chilling purposes, and has contracted with the De La Vergne Refrigerating Machine Co., of New York, for a 15-ton refrigerating machine.

Oconto.—The Oconto Brewing Co. is preparing to equip its plant with a refrigerating machine.

FIRE AND ACCIDENT RECORD.

——The ice house of the Mutual Ice Co. on the Penobscot river, near Bangor, Me., was destroyed by fire March 6th. It contained some 6,000 tons of ice. Value of building, $5,000, with no insurance. Insurance on contents, $3,200. Supposed to have been set on fire by sparks from passing locomotive.

——Fire destroyed the houses of the North Jersey & Pocono Mountain Ice Co. of Paterson, N. J., at Lake Hopatcong, March 6, and as there were no facilities for fighting fire the loss was total.

——The cold storage warehouse and offices of Messrs. Smith & Hyde, produce dealers, at Newark, N. J., were destroyed by fire March 11. Loss estimated at $15,000, partly covered by insurance.

——The plant of the People's Ice Works at Athens, Ga., owned by D. J. Boynton, was completely destroyed by fire March 17, 1900. The plant had just been overhauled, and was about ready to start in operation. Building total loss, machinery badly damaged. Loss, estimated, about $2,500. No insurance. Supposed to have been of incendiary origin.

——An explosion in a restaurant at No. 1302 Filbert St., Philadelphia, Pa., on the 12th ult., wrecked the refrigerating plant, entirely destroying the condenser. An alarm of fire was sent in, but there was no fire, the escaping ammonia being sufficient to quench any incipient fire that might have been occasioned by the explosion. The cause or origin of the explosion seems to be unknown.

OBITUARY.

——Henry D. Sexton, late superintendent of the refrigerator department of the Chicago, Rock Island & Pacific railway, died at his home in Chicago, on Tuesday, March 13, 1900. Mr. Sexton was born in Chicago about fifty years ago, and had always resided there. He was the inventor of the Sexton refrigerator car, in use on the Rock Island and some other roads since 1897. A widow and one son survive him.

——A. V. Ploennies, Chicago agent for the W. J. Lemp Brewing Co., of St. Louis, and connected at various times with the firms of Fred W. Wolf Co., the De La Vergne Refrigerating Machine Co. and the Universal Carbonating Co., died in Chicago, on Thursday, March 1, 1900, of heart disease. Mr. Ploennies was born in Darmstadt, Germany, forty-four years ago, coming to the United States in 1880, and for some time following his profession as a mechanical engineer. He leaves a widow and three children.

THE exports of ice during the month of February, 1900, amounted to 203 tons, valued at $771, as against 1,431 tons, valued at $2,803, for the same period of 1899. For the eight months ending February 28, 1900, the total exports of ice amounted to 8,903 tons, valued at $19,309, as against 17,793 tons, valued at $33,186, for a like period in 1899.

REFRIGERATION ABROAD.

RUSSIA'S FROZEN FISH INDUSTRY GROWING—IMPORTS OF ICE INTO GERMANY—MISCELLANEOUS FOREIGN ITEMS.

THE chief of the department of agriculture in Russia, N. Borodine, has recently issued a book on the fisheries of that country, dealing particularly with the trade in frozen fish. France and Germany's efforts to promote trade in frozen fish by the establishment of freezing works and cold stores are dwelt upon, and details are given concerning the freezing of fish by ice mixtures and by mechanical means in the tzar's dominions. The great and growing resources of the Russian empire add considerable interest to the subject matter of this volume, as it is evident that at no very distant day Russia will become a strong competitor of the United States in furnishing food stuffs for the markets of the world. While the Russian frozen fish exports are as yet inconsiderable, there is abundant evidence that these restless workers are planning to compete for the trade of foreign countries on a large scale. This and other evidences of the activity among the Muscovites has caused the manufacturers of refrigerating machinery of England and of this country to anticipate and prepare for increasing orders for their products in Russian territory.

ACCORDING to a report published in the *Wochenschrift fuer Brauerei* the imports of ice into Germany during the year 1899 aggregated 1,591,832 double centners (about 175,488 tons), representing a value of about 2,276,000 marks ($541,688). This was a considerable decrease from the previous year, when the imports reached 3,569,529 double centners (393,540 tons), which were valued at 5,111,000 marks ($1,216,418). However, 1898 was a record year, and the imports in 1899 were the third largest in the history of the German internal revenue department, the second having been the year 1884, when 2,920,548 double centners (321,990 tons) were imported. The abnormally large imports in 1898 were due to the almost complete failure of the German ice harvest of that year. The winter of 1898–99 yielded a fairly good harvest, hence the decrease of over 55 per cent in the imports as compared with 1898. Fully 91 per cent of the imports in 1899 came from Norway, about 5 per cent from Switzerland, and the balance from other countries, chiefly Russia and Austria.

MISCELLANEOUS FOREIGN ITEMS.

——The city authorities of Dublin, Ireland, are preparing to make improvements in the municipal slaughter house, and propose to provide cold storage facilities for carcasses of sheep, hogs, etc.

——Professor E. Bruekner, former editor of our German contemporary, *Zeitschrift fuer die Gesammte Kaelte-industrie*, has resigned to become manager for the Linde Co. at Moscow, Russia, and is succeeded as editor by Herr Stetefeld, engineer.

——The Societa Anonima della Fonderia del Pignone is the name of a new company at Florence, Italy, which is engaged in the manufacture of refrigerating machinery on the sulphurous acid system. Alberto Zopfi at Milan manufactures ammonia machines, while a company at Turin, organized in 1899, is also engaged in making refrigerating machinery and accessories.

——Reports from Russia indicate that efforts are being made to greatly increase the trade with England in butter. It is claimed that already the trade is extensive, but that the labels attached to packages of Russian high grade butter are removed and altered to Danish or German labels by the agents handling the product. It is proposed to deal directly with the large consumers, and to furnish only first-class butter, using no preservatives, and relying wholly on cold storage for keeping the product in first-class condition, until it reaches the consumer.

——According to reports in the Australian *Pastoralists' Review* the various freezing companies of New Zealand have been preparing for a considerable increase in the export trade of frozen meats in 1900. The increase in exports of sheep and lamb alone is expected to amount to at least 250,000 to 350,000 carcasses. Extensive additions have been made to the works of the Wellington Meat Export Co., at Ngahauranga, the Canterbury Frozen Meat Export Co., at Belfast, the Christchurch Meat Co., at Islington and Timaru, the Southland Frozen Meat Co., at Matura, and the Waitara Refrigerating Co., and the Auckland Refrigerating Co.

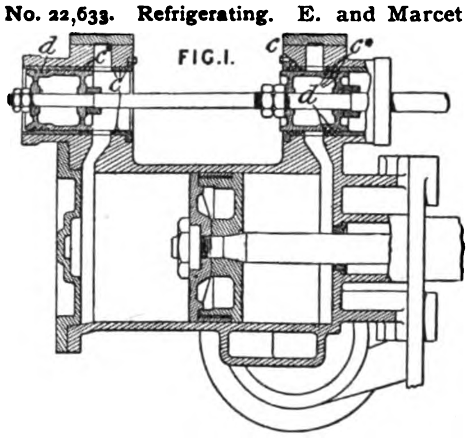
——*Eis und Kaelte Industrie*, discussing the relative values of salt and calcium chloride for brine, sets out a very useful table showing relative freezing points of various strengths of solution:

	Salt.	Calcium Chloride.
A 5% solution freezes at	3.0° Reaumur.	2.0° Reaumur.
10% "	5.9° "	4.5° "
15% "	8.8° "	7.7° "
20% "	11.5° "	11.8° "
25% "	14.2° "	17.7° "

A good way to strengthen the brine is to immerse in it a bagful of salt. The salt dissolves and strains through, leaving dirt and other impurities inside the bag.

FOREIGN PATENTS.

No. 22,633. Refrigerating. E. and Marcet A. Hesketh, both of 23 St. Swithin's lane, London. October 27, 1899.



Relates to the outlet valves of the air expansion cylinders of refrigerating machines. Grooves are made in the valve or in its seat, or in both, as shown at *c*, *c** and *d*. Snow collects in these grooves, and acts as packing to prevent the passage of unexpanded air.

COMPANY ELECTIONS.

——The Peoples' Ice Co., Syracuse, N. Y., has elected new officers as follows: President, Charles Listman; vice-president, John Gebhardt; secretary-treasurer, Charles J. Warner.

——The Sedalia Ice and Cold Storage Co., Sedalia, Mo., has elected the following officers for 1900: S. H. Beiler, president; Ira Hinsdale, vice-president; E. R. Andler, secretary and manager; W. H. Powell, Jr., treasurer.

——The Jackson Ice Co., Jackson, Mich., has been reorganized, and the following officers elected: President, Dr. J. L. Mitchell; vice-president, John Malaney; treasurer, Z. C. Eldred; secretary and general manager, W. M. Palmer.

——The Lehigh Valley Cold Storage and Ice Co., Bethlehem, Pa., has elected officers as follows: President, Adam Brinker; vice-president, Rev. A. J. Long; secretary, A. J. Stauffer; treasurer, Osman F. Reinhard; superintendent, W. J. Kratz.

——The Polar Wave Ice Co., St. Louis, Mo., has elected officers as follows: Chris. Muckerman, president; H. E. Penning, secretary; I. C. Muckerman, treasurer and general manager. The officers, with William L. Huse, constitute the board of directors.

——The Middletown (N. Y.) Ice Co. has elected officers as follows: President, E. A. Brown; secretary and treasurer, John D. Wood; manager, L. G. Wilson; directors, T. A. Weller, E. Brown, L. G. Wilson, C. Macardell, J. W. Miller, W. D. Stratton and J. D. Wood.

——At the recent meeting of the Gainesville (Ga.) Ice Co. the following board of directors was chosen: H. H. Dean, J. H. Hunt, J. H. Martin, Z. T. Castleberry and G. H. Prior. The directors elected Mr. J. H. Hunt, president; Mr. John H. Martin, vice-president, and Mr. W. I. Hobbs, secretary.

——The American Ice Co., of New York, at its annual meeting March 13, 1900, elected the following board of directors: C. T. Barney, C. B. Church, R. L. Campbell, Oram Dennett, John R. Bennett, W. H. Gelshenen, D. W. Hunt, J. W. Haynes, A. W. Hoyt, C. E. Morse, H. P. Morse, J. McCutcheon, H. Miller, R. W. Poor, F. K. Sturgis, Thomas Sturgis and J. D. Schoonmaker. Chas. W. Morse was elected president, D. W. Hunt, W. M. Oler, W. H. Gelshenen and J. D. Schoonmaker, vice-presidents; J. T. Sproul, treasurer, and R. A. Scott, secretary.

ICY ITEMS.

——The Corsicana Ice Co., at Corsicana, Tex., is improving its plant by the enlargement of its storage rooms, addition of new cans, etc.

——The 10-ton ice making plant erected by Messrs. Burford & Eagan at Walla Walla, Wash., commenced manufacture of ice on March 10.

——Messrs. Dodge, Sweeney & Co., of San Francisco, Cal., have leased the plant of the Western Refrigerator Co., at Los Angeles, Cal.

——A 10-ton distilling apparatus is being installed by the Fred W. Wolf Co., of Chicago, in the Star Union Brewing Co.'s plant at Peru, Ill.

——The Bester Ice Co., Hagerstown, Md., have sold their retail business and output, and will hereafter engage only in the manufacture of plate ice.

——The Star Hygeia Ice Co., of Yonkers, N. Y., has bought the good will and the horses, wagons, implements, etc., of the Yonkers Hygeia Ice Co.

——The Newburgh Ice Machine and Engine Co., of Newburgh, N. Y., has recently shipped a 40-ton ice making plant to parties in Merida, Yucatan.

——A. Hambeck & Co., fish packers, Seattle, Wash., are having their plant equipped with new refrigerating coils by the Fred W. Wolf Co., of Chicago.

——The Puritan Brewing Co., of Boston, Mass., has had its brewery equipped with direct expansion piping by the Vilter Manufacturing Co., of Milwaukee, Wis.

——Nic Thomas, brewer, Dayton, Ohio, has equipped his plant with a 30-ton distilling apparatus, supplied by the Vilter Manufacturing Co., of Milwaukee, Wis.

——The Crystal Ice Manufacturing Co., J. G. Anderson, manager, is putting in six sections of ammonia condenser pipes, ordered from the Fred W. Wolf Co., of Chicago.

——The Chase Manufacturing Co., of Boston, Mass., builders of refrigerators, has been merged into a corporation to be known as the Liquid Air Refrigeration and Power Co.

——The new ice factory at Safford, Ariz., mentioned under "New Plants" in last month's issue of Ice and Refrigeration, is a 6-ton plant, and is now about ready for operation by the firm of Prina & Olney.

——The Des Moines Ice Co., Des Moines, Iowa, is preparing to erect a brick barn, 146×34 feet in size, two stories high. It is to have stalls for fifty-two horses. Wagon sheds will be built adjoining the barn.

——The Central Lard Co., of New York city, are having their refrigerating plant overhauled, and a new ammonia condenser put in. The work is being done by the Allen Ice Machine Co., of Brooklyn, N. Y.

——Wm. Mild, of Hamilton, Ohio, secretary of the Standard Ice Machine and Manufacturing Co., is organizing a company at Winchester, Va., to build and operate an ice making and cold storage plant.

——The Mineral Springs Ice Co., of Bethlehem, Pa., whose organization was mentioned in Ice and Refrigeration for October, 1899, expects to have its new ice making plant completed and in operation about the middle of April, 1900.

——The plant of the Crystal Ice Co., at Montgomery, Ala., has been sold by Mr. H. Janney and his associates to J. R. Quinlivan and J. Illingsworth, of Mobile. The new owners are overhauling the machinery and will operate the plant.

——J. Widdridge & Sinclair, Sydney, New South Wales, will equip their plant with four 50-ton Linde compressors, to replace the existing Haslam compressors on H frames. The Linde compressors are to be supplied by the Fred W. Wolf Co., of Chicago.

——The ice manufacturing plant at Lincoln, Ill., formerly owned by Gerard & Shaup, and leased to M. Coogan, has been sold by order of Master in Chancery Perkins to Frank Frorer, for $8,500. The claims against the plant amounted to $10,000 or more.

——The City Ice Co. is the name of a newly organized company which succeeds the firm of Springer & Laffan, ice manufacturers, at Columbus, Ga. The plant, which has a capacity of ten tons daily, has been thoroughly overhauled, and will be under the management of Walter C. Moshel.

——The new plant of the Seaside Ice Manufacturing and Cold Storage Co., at Atlantic City, N. J., is expected to be ready to begin operation about April 1. As mentioned in Ice and Refrigeration for January, this plant will have a capacity for fifty tons ice making, besides its cold storage rooms.

——The new plant of the Appleton Cold Storage and Produce Co., at Appleton, Wis., is completed, and the company opens for business April 1. It is stated that the demands for space already exceed the facilities, and preparations are under way for an additional warehouse to be erected early next summer.

——Elmer E. Gant and Manville H. Gant, who have been operating a 10-ton ice plant at Lebanon, Ind., have decided to remove the plant to Washington, Ind., and operate it there. The firm has been incorporated as the Washington Ice Co., with $10,000 capital stock. The plant is to be ready for operation at its new location by May 1, 1900.

——W. H. Anderton and other members of the Anderton Brewing Co., at Beaver Falls, Pa., have formed a separate company, to be known as the Crystal Ice Co. (incorporated), in order to sell the surplus ice produced by the 50-ton refrigerating machine, with twenty tons ice making capacity, installed in the brewery last summer.

——The Saginaw Produce and Cold Storage Co., at Saginaw, Mich., whose proposed improvement was reported in last month's issue of Ice and Refrigeration, has completed organization under the above name, in order to carry on a general produce and cold storage business. Wm. Barie is president of the company; J. L. Jackson, vice-president; H. M. Schmidt, secretary and treasurer.

——The Maryland Sanitary Refrigerating, Ventilating and Heating Co., of Baltimore, Md., has applied for a state charter, the objects of the concern being given as the "manufacturing, supplying and contracting for, distribution, delivery and use of refrigerating, heating and ventilating agencies from a central plant." The capital of the corporation is to be $100,000. Chas. H. Basshor, D. M. Newbold, W. W. Varney, C. G. Diedman, H. Cassard and O. L. Quinlan are the signatories to the application.

AMONG the exhibits at the Paris Exposition will be a fine display of American fresh fruits. About 2,500 barrels of apples alone will be shown. California fruit will be shipped fortnightly in refrigerator cars and in refrigerated compartments of ocean steamers, in order to keep up the display of pears, peaches and plums. The California legislature appropriated $70,000 for the state's horticultural exhibit at Paris.

A COLD storage bill, drafted by the Canadian government, provides that any five persons may form a company, with the object of promoting the cold storage of fruits, dairy produce, etc. The lieutenant governor in council may grant one-fifth of the cost of the building, but no grant is to exceed $500. All grants are to be made within five years, and the public works commissioner must approve the cold storage building before the bonus is given.

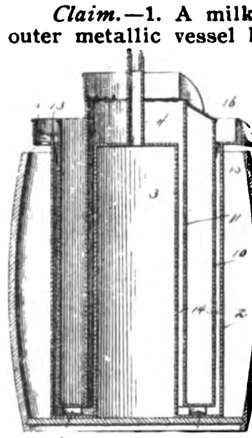
NEW PATENTS.

WE append below the most important new patents relating to the ice, ice making, refrigerating, cold storage and kindred trades that have been issued from the patent office during the past month, reported expressly for Ice and Refrigeration. All inquiries relative to patents or trade marks in the United States and foreign countries should be addressed to William S. Beaman, counsellor at law and solicitor of patents, 99 Cedar street, New York city.

LIQUID COOLER.

No. 642,456. Lars C. Ibsen, Irene, S. D. Filed June 29, 1899. Serial No. 722,313. Patented January 30, 1900. (No model.)

Claim.—1. A milk cooler involving the combination of an outer metallic vessel having an internal hollow cylinder or drum, an annular enlargement at the upper end, a milk overflow spout 7 leading from said enlargement, a pocket also formed in said enlargement, having a passage leading from its bottom, and an inner vessel having an interior concentric open ended cylinder, a water overflow spout leading from the vessel, and a foam overflow spout leading from the concentric hollow cylinder, and means for introducing water, substantially as described.

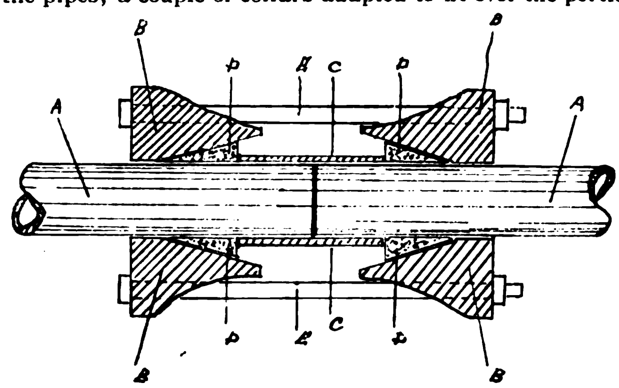


2. A milk cooler involving the combination of an outer metallic vessel having an internal hollow cylinder or drum, with water supply pipe communicating with the drum and having an annular enlargement with a milk overflow spout leading therefrom, and a pocket in the enlargement with a passage leading from the bottom thereof, and an inner vessel having an interior concentric cylinder with water supply pipe leading to the bottom between the vessel and its concentric hollow cylinder, a water overflow spout, and a foam overflow spout, substantially as described.

AMMONIA PIPE COUPLING.

No. 644,167. Charles E. Frink and Morris Murphy, Chicago, Ill. Filed October 14, 1899. Serial No. 733,580. Patented February 27, 1900. (No model.)

Claim.—1. In a pipe coupling, the combination of a metal collar adapted to fit over and cover the meeting line of the pipes, and to extend on both sides of such line; a transversely divided soft metal sleeve, each of whose two portions or sections fits over and incloses one of the opposite end portions of the collar and the adjacent portions of the pipe, the outer surfaces of said portions or sections being tapered away from the meeting line of the pipes; a couple of collars adapted to fit over the portions

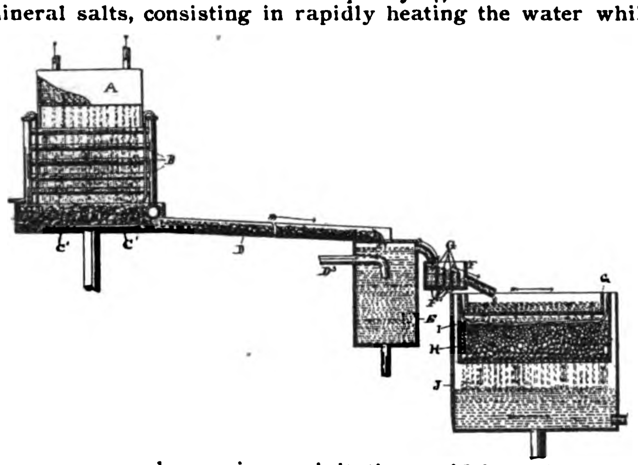


or sections of the soft metal sleeve, and made with their interiors internally tapered in substantial correspondence with such portions or sections, said collars being extended toward one another so that their flaring ends substantially meet, and the two portions or sections of the soft metal sleeve practically filling and being substantially all confined within said collars, and bolts for drawing such collars toward one another, each of said bolts being extended between and engaging flanges formed on said collars, whereby the adjustment of one set of bolts tightens both collars.

METHOD OF PURIFYING WATER.

No. 645,190. Adam Schantz, Dayton, Ohio. Filed December 11, 1899. Serial No. 739,888. Patented March 13, 1900. (No specimens.)

Claim.—1. The method of purifying water containing mineral salts, consisting in rapidly heating the water while

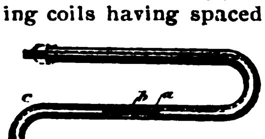


in a spray or shower, in precipitating said heated spray or shower on to beds of boulders which are heated thereby and maintained at a high temperature, in agitating the water after it falls on said boulders, and in passing the water while in said agitated condition through a shallow gutter having its bottom lined throughout with boulders and gravel, whereby the heavier mineral substances are separated from the water, substantially as set forth.

ART OF MANUFACTURING TEMPERATURE EQUALIZING COILS.

No. 644,841. Frank Allen, New York, N. Y., assignor to the Allen Ice Machine Co., same place. Filed November 16, 1899. Serial No. 737,165. Patented March 6, 1900. (No model.)

Claim.—1. The art of manufacturing temperature equalizing coils having spaced interior and exterior tubes, the same consisting in interposing a helical spacing wire between the tubes, and thereby forming a passage between the tubes, and then bending the said parts one on the other so as to form a coil.

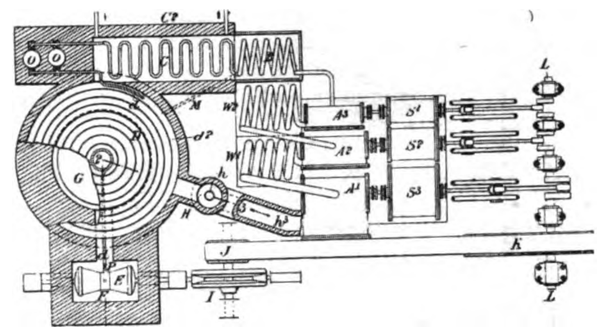


2. The art of manufacturing temperature equalizing coils having spaced interior and exterior tubes, the same consisting in the following steps, namely; placing a helically wound wire around a tube, inclosing said tube and wire within another tube, then heating the parts of the tubes to be bent, and finally bending the said parts at their heated portions, so as to form the sinuosities of the coil, as set forth.

APPARATUS FOR REFRIGERATING AND LIQUEFYING AIR OR OTHER GASES.

No. 642,505. Edgar C. Thrupp, Walton-upon-Thames, England. Filed February 28, 1899. Serial No. 707,202. Patented January 30, 1900. (No model.)

Claim.—1. In an apparatus for refrigerating and liquefying air, the combination of a turbine inclosed in a non-conducting jacket or casing having annular spaces around the

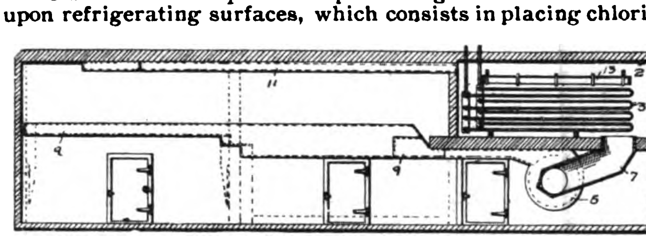


shaft where it passes through the said casing, and all thrust or guide blocks and bearings situated outside the said jacket or casing, to keep them at a distance from the motor parts of the said turbine, in which the air or gas or gases is or are expanded and caused to do external mechanical work, means for compressing the air or gas or gases, consisting of two or more compressing cylinders operating step by step with intermediate cooling coils and means for cooling the air or gas or gases while under high pressure down to a temperature below the freezing point of water, a chamber, or chambers in duplicate, through which the air or gas or gases are passed, and in which the moisture and other impurities are deposited mostly as snow, and separated, and a heat interchanger for further cooling the air or gas or gases.

PROCESS OF PREVENTING FORMATION OF FROST ON REFRIGERATING SURFACES.

No. 644,847. Madison Cooper, Minneapolis, Minn. Filed September 25, 1899. Serial No. 731,557. Patented March 6, 1900. (No specimen.)

Claim.—1. The process of preventing the formation of frost upon refrigerating surfaces, which consists in placing chloride



of calcium, or other deliquescent salt in a solid form, in proximity to said surfaces, permitting the moisture of the atmosphere to unite with said deliquescent salt to form a brine, and allowing said brine to flow over said refrigerating surfaces.

TRADE CORRESPONDENCE.

SUGGESTIONS BY READERS OF ICE AND REFRIGERATION—TO COOL MAGAZINES OF BATTLESHIPS.

[The publishers of ICE AND REFRIGERATION do not hold themselves responsible for the opinions expressed by correspondents on any topic; but these columns are at all times open for the discussion of subjects of interest to the trade, and such correspondence is at all times welcomed. Our readers are cordially invited to contribute to this department, by giving their views on questions propounded, or by suggesting original topics for trade discussion, or notes on the condition of trade in their section of the country. Anonymous letters will receive no attention whatever. Parties who desire to communicate with correspondents will address them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago.—ED.]

TO COOL MAGAZINES OF BATTLE SHIPS.

LONDON, February 23, 1900.

To the Editor: In your last edition under the above heading you mention some experiments conducted by Rear Admiral O'Neil, and it is stated that: "No success has attended trials of that character conducted abroad."

We beg that you will allow us to correct this statement, and to add that we have long since passed the experimental stage in cooling magazines of battle ships, as some two years ago, among other battle ships of H. M. navy, which we fitted with our refrigerating machines, the *Sans Pareil* had a complete cooling plant for her magazines.

We have similarly fitted war ships for several of the foreign powers, and would particularly mention the six Dutch cruisers recently built, all of which have been entirely satisfactory. BERNARD GODFREY, *Managing Director*,

For J. & E. HALL, LTD.

TRADE LITERATURE.

A NEW 24-page circular in colors has recently been issued by the Peerless Rubber Manufacturing Co., of 16 Warren street, New York city, descriptive of the Rainbow packing manufactured by this firm, giving also description of the various gaskets, gauge glass rings, pump valves, disks, tubing, belting, etc., included in the firm's supplies for ice manufacturers and cold storage warehousemen. The little book is gotten up neatly, printed in three colors to make it attractive, and is more concise than such circulars usually are. It is handy to have about the factory, and may be obtained by writing to the firm at above address.

WANTED AND FOR SALE ADVERTISEMENTS.

[The charge for advertisements in this column is $2 each insertion for seventy words or less, and twenty-five cents for each additional fourteen words. No advertisements will be inserted unless accompanied by the necessary cash. Parties answering these advertisements must write to the addresses given, as the publishers decline to furnish any information concerning them.]

Ice Machine Wanted.

WANTED.—Second-hand ice making plant, complete, capacity about ten tons of ice per day. Send full particulars to F. L. BROWN, 4800 North Clark street, Chicago, Ill.

Ice Plant for Sale.

FOR SALE.—Five-ton ice plant, complete or in part, such as compressor, 3-ton, ice cans, pipe, valves, manifolds, pumps, boiler, brine tank, etc. Address J. C. ROGERS & CO., Wamego, Kan.

Position Wanted.

WANTED.—An absorption engineer with nine years' experience. Can do repairing, etc. Has had charge of 50 and 75-ton plants. Wants a position. Address "PETE," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Refrigerating Machine for Sale.

Six-ton refrigerating compression machine, American Ice Machine Co.'s make, in actual use only three years. Has atmospheric condensers, number 1 condition. Twelve hundred dollars cash if taken at once. Address ERNEST HOFFMAN, Lexington, Mo.

Position Wanted.

POSITION WANTED.—By a practical ice machine man; sixteen years' building, erecting, selling and operating ice plants. Thoroughly posted in both systems. Best of references. Address O. JEFFRIES, care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Ice Making Plant Wanted.

WANTED.—Twelve to 20-ton ice making plant, second-hand. Will take plant complete, or parts of plant. Everything must be in good condition, of modern make and first-class. Can use either absorption or compressor machinery. HUTCHINSON ICE CO., Hutchinson, Kan.

Situation Wanted.

WANTED.—Situation for 1900 by first-class compression ice engineer; 25 years' experience; can go any place on short notice; large plant preferred; will take stock or interest in good plant for half of salary. Address "COMPRESSION 25," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Position Wanted.

WANTED.—Position by first-class refrigerating and electrical engineer as chief engineer or manager of ice or electric light plant. Have had wide experience and can give best of recommendations from all my employers. Can do repair and construction work. Address, "LESS, COAL," room 413 Jackson building, Nashville, Tenn.

Engineer Wanted.

WANTED.—A first-class engineer for absorption ice machine, run on the plate system. Must have had experience with absorption plate plant, and be able to make own repairs. To competent man a permanent position. Reference as to experience and character required. Address, stating salary expected, etc., J. W. HAMMOND & SONS, Alexandria, Va.

Position Wanted.

WANTED.—As engineer, or to take charge of the mechanical department of an ice and cold storage plant. Familiar with both plate and can systems. Has had fourteen years' experience in erecting and operating large plants of the compression system. Can give best of references. Address "W. F. J.," care ICE AND REFRIGERATION, 206 Broadway, New York city.

Assistant Engineer Wanted.

WANTED.—By an ice manufacturing and refrigerating company, a competent man to serve as an assistant chief engineer, to take charge of the plant and employes on alternate weekly twelve-hour watch, and to work under the general supervision of a chief engineer. (Compression machines.) The best of reference as to ability and character will be required. Answer to "M. C.," care of ICE AND REFRIGERATION, 177 La Salle street, Chicago, stating wages wanted.

T. B. WRIGHT & CO.

ESTABLISHED 1824
SAMPLES AND PRICES SENT ON APPLICATION

MANUFACTURERS OF RE-CARBONIZED GRANULATED **CHARCOAL** FOR FILTERING AND ARTIFICIAL ICE MANUFACTURING

OFFICE, 117 WOOD ST., PHILADELPHIA — MILLS, BERLIN, N. J.

The E. B. Newman Charcoal Co., THOMAS KEERY, President. E. B. NEWMAN, Sec'y and Treas.
Successors to E. M. MERRILL. MANUFACTURERS OF

Lump, Pulverized and Granulated

Granulated Charcoal for Ice Manufacturers a Specialty at the old established place **CHARCOAL** and Pulverized Charcoal for Sinclair Rectifiers.

544, 546 AND 548 WEST TWENTY-FIFTH ST.
BETWEEN TENTH AND ELEVENTH AVES. NEW YORK

JOHN R. ROWAND

MANUFACTURER OF

Re-Carbonized, Pulverized and Granulated ... **CHARCOAL**

For Chemical, Rectifying and Foundry Purposes; also for Ice Manufacturers a specialty.

ENTERPRISE MILLS, CLEMENTON, Camden Co., N. J.

REFERENCES—United States Mint, Rosengarten & Sons, Stuart, Peterson & Co., Philadelphia Warehousing and Cold Storage Co., Philadelphia.

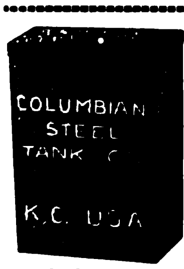
MR. JOHN R. ROWAND. PHILADELPHIA, PA., March 3, 1898.
Dear Sir: We have been using your Re-carbonized Granulated Charcoal for a long time, and cheerfully add my testimony as to its quality and cleanliness, effectiveness as a filtering.
Yours truly, JOHN W. EDMUNDSON,
Chief Engineer Philadelphia Warehousing and Cold Storage Co.

Our Specialty is RE-CARBONIZED **CHARCOAL** For Filtering Purposes

We can send a list of over four hundred firms who pronounce our Coal the **Purest** and **Cleanest**. We can also furnish

FANS, ICE CANS, BRUSHES, WHEELBARROWS.

J. S. McCORMICK CO., Pittsburgh, Pa.



THE COLUMBIAN STEEL TANK CO.

MANUFACTURERS OF

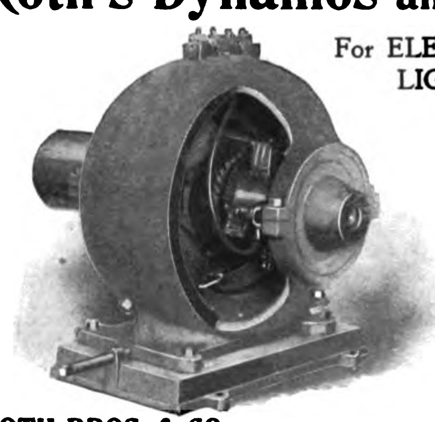
Galvanized Steel Storage Tanks

For Ice Manufacturers and Cold Stores.

ICE CAN FILLERS, ICE CANS, all sizes, CREAMERY TANKS.

917 MULBERRY STREET, KANSAS CITY, MO.

Roth's Dynamos and Motors



For ELECTRIC LIGHTING and POWER SERVICE.

First-Class Machines.

Durable, Efficient, Compact.

Fully Guaranteed.

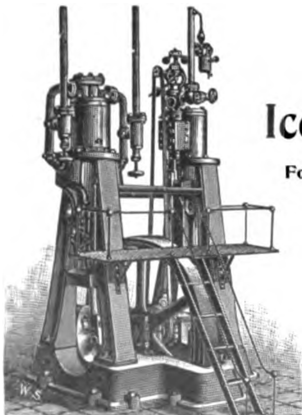
Address

ROTH BROS. & CO., Mfrs., 91 W. Jackson St., CHICAGO, ILL.

J. F. MAYNARD, SUCCESSOR TO American Ice Machine Co.

MANUFACTURER OF

Refrigerating and Ice Making Machines



For Ice Manufacturers, Brewers, Butchers, Packers, Dairies, etc.

Machines of One to One Hundred Tons Capacity.

Estimates and Descriptive Circulars cheerfully furnished.

Office and Shops, 320-322 S. Third St.
ST. LOUIS, MO.

ENGLISH AND GERMAN ... **BOOKS** ON

Ice Making and Refrigerating

Following is a list of the principal works relating to Ice Making and Refrigerating, published in the English and German languages:

- COMPEND OF MECHANICAL REFRIGERATION (3rd Edition). By J. E. SIEBEL. Chicago. Flexible Morocco, $3.50; Cloth, $3.00.
- PRACTICAL ICE MAKING AND REFRIGERATING. By EUGENE T. SKINKLE. Chicago. Flexible Morocco, $2.00; Cloth, $1.50.
- INDICATING THE REFRIGERATING MACHINE. By GARDNER T. VOORHEES Chicago. Flexible Morocco, $1.50; Cloth, $1.00.
- THEORETICAL AND PRACTICAL AMMONIA REFRIGERATION. By ILTYD I. REDWOOD. New York. $1.00.
- PRACTICAL RUNNING OF AN ICE AND REFRIGERATING PLANT. By PAUL C. O. STEPHANSKY. Boston. $2.00.
- ICE MAKING MACHINES. By M. LEDOUX. New York. 50 cents.
- REFRIGERATING AND ICE MAKING MACHINES. By A. J. WALLIS-TAYLOR. London. $3.00.
- REFRIGERATING MACHINERY. By A. RITCHIE LEASK. London. $2.00
- THERMODYNAMICS, HEAT MOTORS AND REFRIGERATING MACHINERY. By De VOLSON WOOD. New York. $4.00.
- DRINKING WATER AND ICE SUPPLIES. By T. MITCHELL PRUDDEN. New York. 75 cents.
- THEORY OF HEAT. By J. CLARK MAXWELL. London. $1.50.
- ELEMENTARY LESSONS IN HEAT. By S. E. TILLMAN. New York. $1.50.
- HEAT AS A POWER OF ENERGY. By R. H. THURSTON. New York. $1.25.
- REFLECTION ON THE MOTIVE POWER OF HEAT. By L. L. CARNOT. New York. $1.50.
- THE PRINCIPLES OF THERMODYNAMICS. By ROBT. ROENTGEN. New York. $5.00.
- EIS UND KAELTEERZENUNGS MASCHINEN. Von GOTTLIEB BEHREND. Halle a-s. $3.50.
- KOMPRESSIONS KAELTEMASCHINEN. Von R. E. DE MARCHENA. Halle a-s. $1.25.
- NEUERE KUEHLMASCHINEN. Von HANS LORENZ. Munchen. $1.75.
- THERMODYNAMISCHE STUDIEN. Von J. WILLARD GIBBS. Leipzig. $4.25.
- DIE MECHANISCHE WAERMETHEORIE. Von R. CLAUSIUS. Braunschweig. 3 vols. $7.50.
- DIE KAELTEINDUSTRIE. Von THEODORE KOLLER. Wien. $1.75.

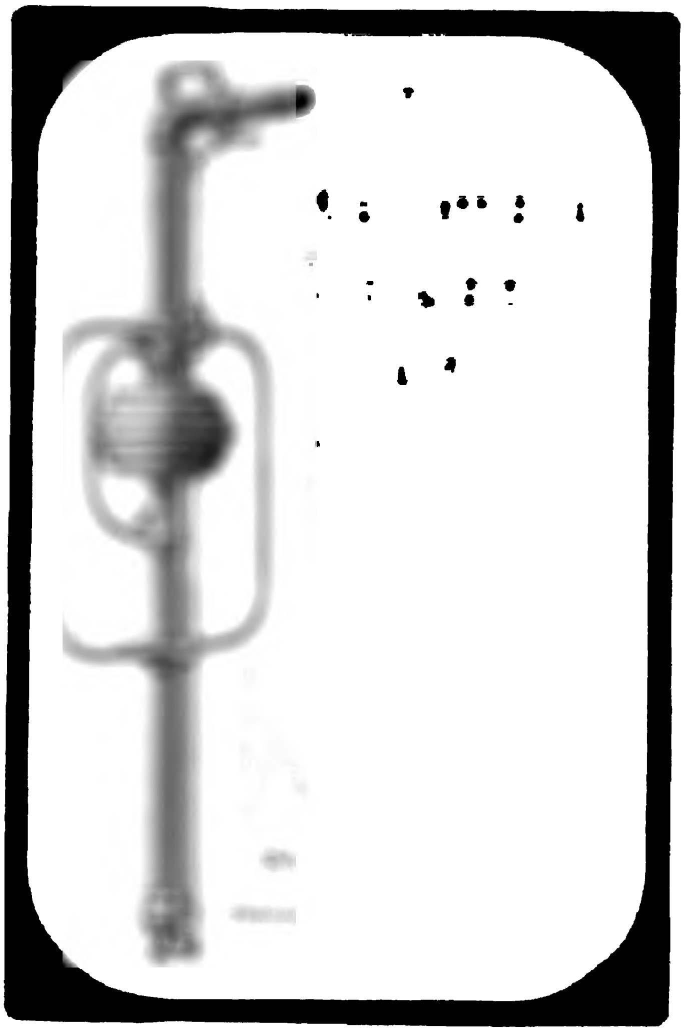
Any of these books can be ordered through

H. S. RICH & CO., 177 La Salle St., CHICAGO.

Now Ready for Delivery

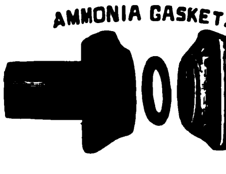
INDICATING REFRIGERATING MACHINE

H. S. RICH & CO



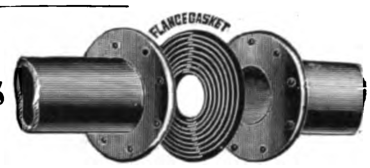

STURTEVANT SYSTEM
HEATING & VENTILATION

GUILLOTT'S
Corrugated Lead Gaskets



Are cheaper and better than rubber.
For Ammonia Joints.
We are the inventors. All others are infringements.
Manufactured in any size.

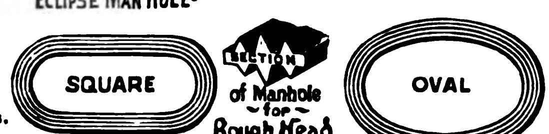
CORRUGATED
Copper Gaskets
METAL FLANGE GASKETS.



Our Metal Man and Handhole Gaskets

HAVE BROKEN ALL RECORDS.
This Gasket for Stirling Boilers, Eclipse and Filled Plate Manheads.

This Gasket for Common and Rough ManholePlates.



IN ORDERING, GIVE SHAPE OF GASKET, AND INSIDE DIMENSIONS.

Our Metal Manhole Gaskets cost no more and will outwear twelve Rubber Gaskets.

PROOF.—We will send Gaskets to any address on thirty days' trial. If not as represented, return at our expense.

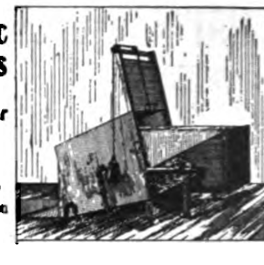
We buy the old metal back f. o. b. cars your city, thus reducing cost.

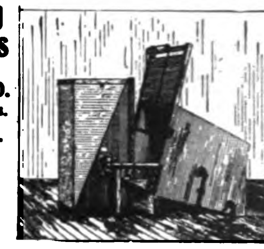
Guillott's Metal Gasket Co.
84 Market Street, CHICAGO, ILL.

Automatic Conveyors Without Motive Power

Ice Elevators of any description for storage, and

Ice Releasing Apparatus





H. MOCK & CO.
Patentees and Mfrs.
171 E. 92d St.
NEW YORK

References Given
Correspondence Solicited

STRICTLY UP-TO-DATE

A PATENT AND IMPROVED METHOD OF PLATE AND BLOCK ICE FREEZING, without artificial circulation or agitation of the freezing water.

The ice is free from air needles, uniform in thickness and quality, and freezes more rapidly, thus increasing the capacity of the plant and avoiding the operation of a pump, air compressor or other steam or power consuming apparatus.

UNAGITATED WATER FREEZING COMPANY
Walnut Lane Station, PHILADELPHIA, PA.

B. P. CLAPP AMMONIA COMPANY,

MANUFACTURERS OF

ABSOLUTELY PURE ∴

LIQUID ANHYDROUS AMMONIA
26° AQUA AMMONIA

CONTAINING 29¼ PER CENT OF AMMONIA.

FOR REFRIGERATING PURPOSES AND THE TRADE

General Offices, 245 Broadway, NEW YORK.

HERF & FRERICHS CHEMICAL CO.

ST. LOUIS, MO.

Manufacturers ...of **Liquid Anhydrous Ammonia**

OUR AMMONIA CAN BE HAD OF THE FOLLOWING:

ATLANTA, GA.—Fred W. Wolf Co.
CHICAGO—Westerlin & Campbell.
F. K. Higbie.
Newberry Warehouse and Storage Co., 79 Kinzie St.
CLEVELAND, OHIO—Cleveland Brewers Supply Co.
DENVER, COLO.—Bridaham-Quereau & Co.
DETROIT, MICH.—Farrand, Williams & Clark.
HOUSTON, TEX.—D. M. Garvin, Lone Star Oil Co.
INDIANAPOLIS, IND.—Holt Ice and Cold Storage Co.
KANSAS CITY, MO.—Abner Hood.
LOUISVILLE, KY.—Kentucky Malt and Grain Co.
NEW ORLEANS, LA.—United Warehouse Co., Ltd.
NEW YORK—Herf & Frerichs Chemical Co., 133 William St.
SOUTH OMAHA, NEB—Cudahington & Wilcox, 2415 N St.
ST. PAUL, MINN.—C. B. Lyon & Bro.

ABSOLUTELY DRY, PURE AND UNIFORM ALL THE YEAR ROUND.

26° Ammonia

SPECIALLY PURIFIED FOR ABSORPTION MACHINES.

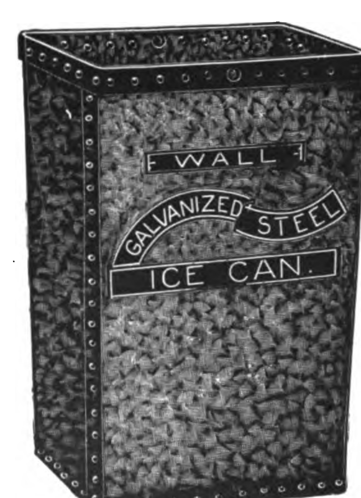
All our Ammonia is made from **SULPHATE AMMONIA** only.
Large capacity, best qualities and quick shipments.

ICE CANS

WE ARE PREPARED
TO FURNISH
ESTIMATES FOR
EVERY CLASS OF

**GALVANIZED
IRON WORK**

USED IN
THE MANUFACTURE
OF ICE



EVERY SIZE.

P. WALL MANUFACTURING SUPPLY CO.

718 CASS AVE., ALLEGHENY, PA.

WINDLE'S PATENT IMPROVED GALVANIZED STEEL

ICE CANS

IRON-CLAD GUARANTEE { If they leak within five (5) years, in ordinary use, I agree to repair or replace them free of charge....

I HAVE GOT THE GOODS AND AM NOT AFRAID TO BACK THEM.

PEOPLE GUARANTEE OTHER THINGS, WHY NOT ICE CANS?

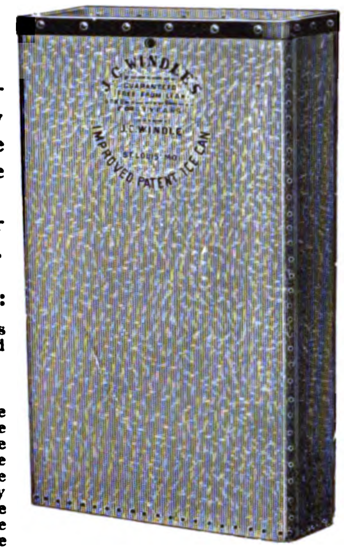
TRY to get such a guarantee from any other reliable firm in the United States. They dare not give it. I dare not give it on the ordinary can. Always ask for and demand the guarantee in buying cans, and be convinced.

I make the ordinary can, too, and, like all other firms, do guarantee it tight when delivered only.

What Some of the Managers of Leading Ice Plants Say:

We have 1,700 of your 300-pound Windle Patent Ice Cans in use for the past two seasons, and are perfectly satisfied with them. EAST ST. LOUIS ICE AND COLD STOR. CO., East St. Louis, Ill., W. S. ASHTON, Manager.

We have over 3,000 ordinary ice cans in use. They have always leaked and caused us loss in salty blocks. We have tried many tinners, and paid large sums of money to have them resoldered, and they still leaked, getting worse all the time, until three years ago, when we had new "Windle Patent" bottoms put in them. We have had no leaks or salty cakes since. We can highly recommend the "Windle Ice Can," manufactured by J. C. Windle, as the only one we have ever seen which will not leak. We have found his guarantee with us as good as gold.
GRIESEDIECK ARTIFICIAL ICE CO., ROBT. BAUER, Secretary.



CAPACITY, 200 PER DAY.
Patent No. 572,234.
Any Size, Weight or Style.

Repair and Rebottoming Department.

To the Manufacturers of Artificial Ice Any Place in the United States:

DO YOUR ICE CANS LEAK?

Are they a continual source of annoyance and expense? Are you troubled with salty blocks? Have you paid out money to have them soldered over and over? Do they still leak? Have you come to the conclusion that they cannot be made tight?

I CAN GET YOU OUT OF TROUBLE.

It costs you nothing to prove it to your entire satisfaction. Send me one of your old cans by freight, no matter how rusty it looks or how long it has leaked, or who has tried to fix it. I will put a **new Windle Patent bottom** in that can and return it to you free of charge. All you pay is the freight both ways (which is trifling). After receiving and using this can, if you should desire to have all or any part of your cans rebottomed, write for price, stating how many. If not, just **keep your eye on that can for the next five years.** That is all the pay I want. It sells my cans and gets me work. If you do not need me now, you will later on. I ship the bottoms to your plant, **no matter where you are located,** and send men to put them in. I have men constantly on the road putting in bottoms, and handle so many that I have got the cost down to a minimum. Send on your old cans and see something that will surprise you.

FILTERS, REBOILERS, BRINE PIPES, TANKS, and all SHEET IRON WORK required in the construction of Ice Plants, Breweries, Cold Storages, etc. Write for prices.

J. C. WINDLE, 2701 North Ninth Street, St. Louis, Mo.

P. I. M. & R.

What "The Boy" Said

"PRACTICAL ICE MAKING AND REFRIGERATING"

Is a practical, common sense treatise on the construction and operation of Ice Making and Refrigerating Machinery and Apparatus, covering the entire series of articles published in "ICE AND REFRIGERATION."

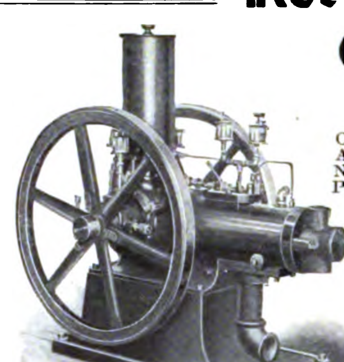
By EUGENE T. SKINKLE
("THE BOY.")

PRICE { *Bound in Cloth,* . . . . *$1.50*; *Bound in Morocco,* *$2.00*

SENT PREPAID TO ANY ADDRESS ON RECEIPT OF PRICE.

H. S. RICH & CO., Publishers,
206 Broadway, NEW YORK. 177 La Salle St., CHICAGO.

THE MIETZ & WEISS **Kerosene and Gas Engine**



BURNS KEROSENE.

Cheaper and safer than gasoline. Automatic, simple and reliable. No electric battery or flame used. Perfect regulation.

REFRIGERATION

The most economical and durable power for running refrigerators.

AND POWER ALL PURPOSES.

SEND FOR CATALOGUE.
MARKT & CO., LTD., LONDON, HAMBURG, PARIS.

A. MIETZ,
128-138 Mott St., N. Y. CITY

THE SELLE GEAR CO. AKRON, OHIO

SOLE MANUFACTURERS OF
SELLE'S PATENT TRUSSED

**ICE WAGON,
BREWERY WAGON,
PLATFORM WAGON,**

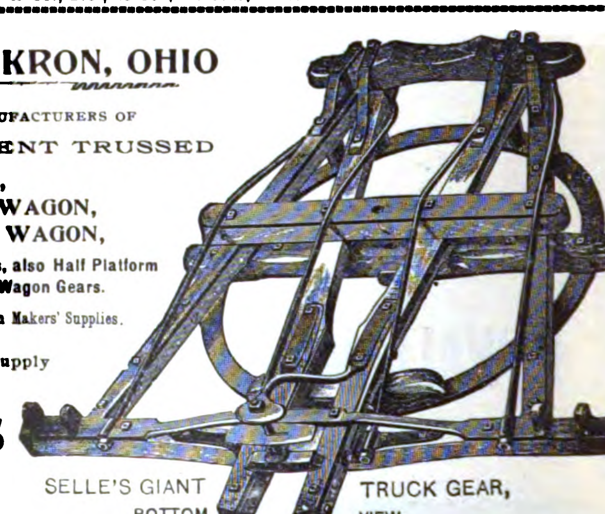
Truck and Omnibus Gears, also Half Platform **and Three-Spring Wagon Gears.**

For sale by all Dealers in Wagon Makers' Supplies.

We are prepared to supply complete

Ice Wagons

of best construction at reasonable rates.



SELLE'S GIANT TRUCK GEAR, BOTTOM VIEW.

NEW YORK OFFICE, 85 CHAMBERS STREET

HOHMANN & MAURER MFG. CO. ROCHESTER, N.Y.
H&M TRADE MARK
41 ELIZABETH STREET

LONDON OFFICE, 106 HATTON GARDEN, E. C.

WRITE FOR CATALOGUE

FIG. A-4

MAKERS OF

Thermometers

FOR ALL

REFRIGERATING
ICE MAKING AND
COLD STORAGE
PURPOSES

THERMOMETER FOR
BRINE TANKS, PUMPS
AMMONIA PIPES
AND STILLS

INSULATED BRINE PIPE
THERMOMETER
FREE FROM FROST

CERTIFIED EGG ROOM
THERMOMETER, ETC.

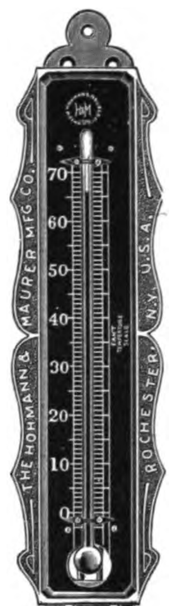
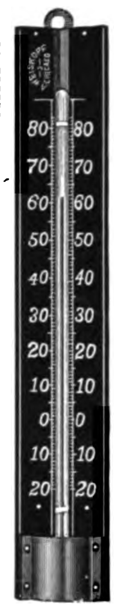


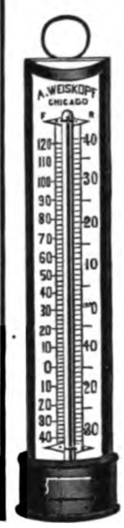
FIG. 31.

THERMOMETERS AND HYDROMETERS...

Ice Machine Thermometers and Ammonia Hydrometers.

CELLAR AND CHILL ROOM THERMOMETERS.





THERMOMETERS
FOR
BRINE TANKS,
BRINE PUMPS,
ETC.

A. WEISKOPF

MANUFACTURER

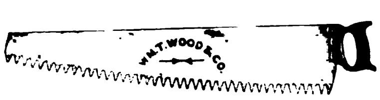
67-69 South Canal St.

CHICAGO

WOOD'S ICE TOOLS

FINEST QUALITY

FOR ICE FACTORIES AND DELIVERY WAGONS



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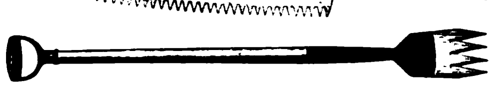

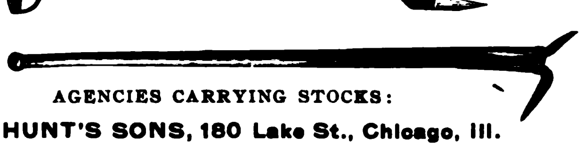

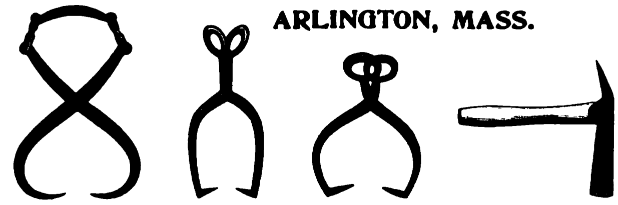

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SELDEN'S PATENT PACKINGS... FOR STUFFING BOXES.

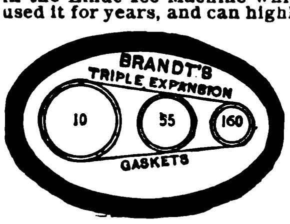
With Rubber or Canvas Cores.

The BEST Packing for Ammonia, Air, Steam or Water. Used in Ice and Refrigerating Plants in this and other countries. Give it a trial. If your supply store does not keep it in stock, ask him to get it from the manufacturer.

SHOENBERGER, SPEER & Co., BLAST FURNACES.
MR. RANDOLPH BRANDT. PITTSBURGH, PA., Feb. 5, 1892.

DEAR SIR: Yours of the 3d inst. just to hand, and in reply would state that for Ammonia I consider the SELDEN far superior to any packing that I ever handled. Such was my experience in the Linde Ice Machine which I had charge of. For steam and hydraulic purposes I have used it for years, and can highly recommend it. Yours very truly,

HENRY M. QUIG, Chief Engineer.



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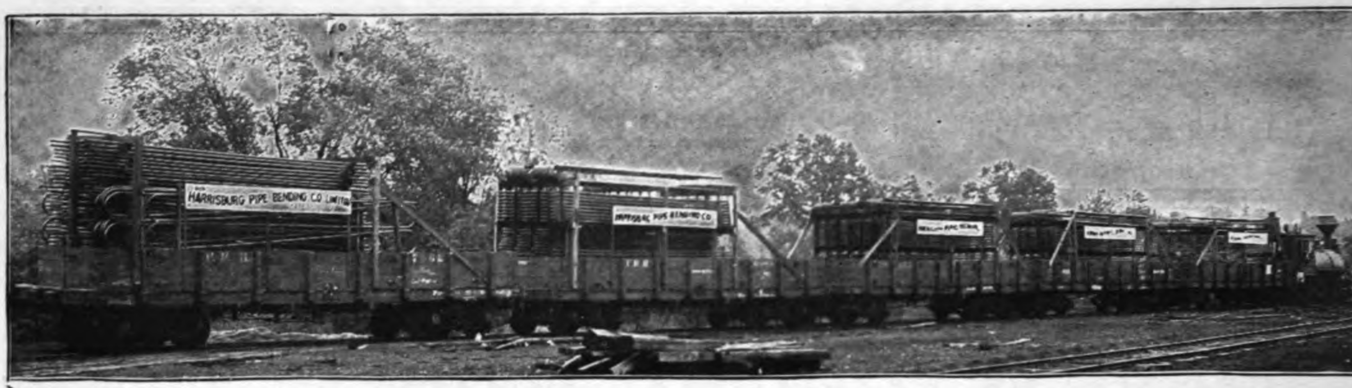
...FOR BOILERS...

These gaskets are used on boilers carrying 180 pounds pressure, and give universal satisfaction.
HOSE, JOINT PACKINGS AND TOOLS of the best grades carried in stock.

RANDOLPH BRANDT.... 38 Cortlandt Street, NEW YORK, U. S. A.



IRON
COPPER
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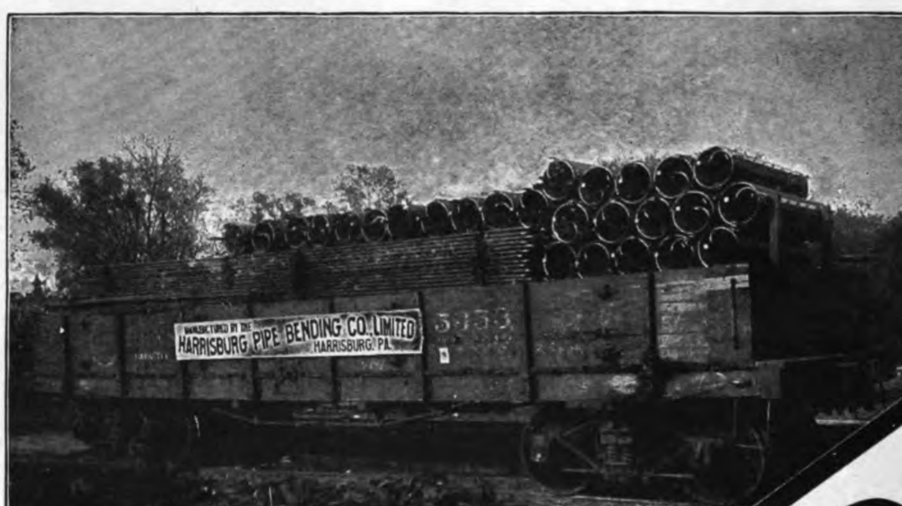
COILS



Bends and **Manifolds**

FOR ALL PURPOSES

Wrought Iron Ammonia Cocks

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STILLS and **ABSORBERS**

FOR ABSORPTION AMMONIA
ICE AND REFRIGERATING MACHINES

SPECIAL ATTENTION GIVEN TO REPAIRS FOR EXISTING ICE MACHINES


Carbonic Acid Gas
Cylinders
Bending Co. Ltd.
GALVANIZED
STEEL OR IRON
Ice Cans
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BENDS

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BOYLE UNION
AMMONIA HEADER
COUPLING
GLAND END RETURN BEND
OUR SPECIALTY
TANKS, BRINE CONDENSERS....
OPEN AIR CONDENSERS COMPOUND EFFECT
EXPANSION COILS BOTH FOR BRINE AND DIRECT GAS
VALVES AND FITTINGS FOR AMMONIA
CAST IRON BRINE BEND
Allow us to remind you that this is the time to overhaul your machines for the coming season, and that we manufacture and carry in stock all parts of Ice Machinery (except engines and compressors) for immediate use.
WROUGHT IRON RETURN BEND
AUTOMATIC AMMONIA GAUGE
NASON MANUFACTURING CO.
71 BEEKMAN STREET
SEND FOR OUR CIRCULAR.
NEW YORK CITY.
SIDELUG
NASON STEAM TRAP
ELBOW
BRINE COCK
TEE
GLOBE VALVE


JARECKI MANUFACTURING CO., ERIE, PA.
MANUFACTURERS OF MALLEABLE AND CAST IRON
AMMONIA, GAS, FITTINGS STEAM and WATER
BRASS AND IRON VALVES AND COCKS, STEAM AND HOT WATER RADIATORS.
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The Erie Union is extra heavy and provided with a soft copper packing ring, which is superior to all devices, and is held in position by being forced into a groove under pressure, which prevents the packing from falling out of place when the union is taken apart, and can be screwed and unscrewed indefinitely without the least injury to the packing, which is almost indestructible. The copper packing being soft enough to form a good tight joint, and also not as liable to injury by any hard substance getting between the packing and seat, as would be the case if softer metal packing is used.
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FLANGE UNION
MALLEABLE FLANGE UNION
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AUTOMATIC STEAM FLUE CLEANER.

Gloekler's Improved Refrigerator Door Fastener

PATENTED JANUARY 20, 1891.

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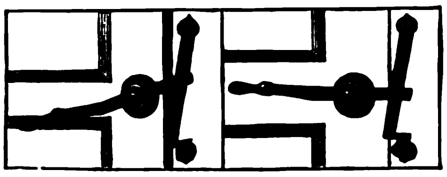


GIVES SATISFACTION EVERYWHERE.

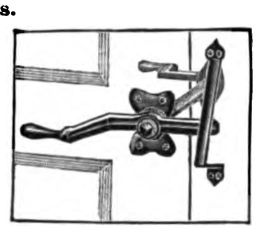
ONCE TRIED, ALWAYS USED.

By reversing the lever the door can be forced open, as shown in the left illustration. **They can be used right or left.** Made in five sizes to suit large or small doors. Malleable iron and well tinned. They are very strong and durable, are placed flush on the surface of door, thus easily applied. Can also be had in nickel-plated and polished brass.

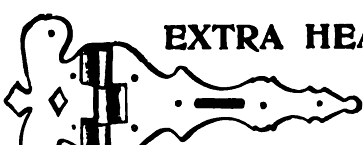
There are two sizes which operate on inside of door also.

No. 0. For doors 10 in. thick and less, 16-in. lever, including handle.

No. 00. For doors 6 in. thick and less, 13-in. lever, including handle.



For Cold Storage Houses they have no equal.



EXTRA HEAVY HINGES...

FOR COLD STORAGE ....WAREHOUSES.

Write for descriptive Price List.
All wide-awake dealers sell them.

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HAVE YOU EVER TRIED

CRUSHED QUARTZ

FOR YOUR

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Hard and sharp as glass, and indestructible.

Fire Brick, Portland Cement, etc.

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HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO. HARTFORD, CONN.

ORGANIZED 1866 ORGANIZED 1866

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Insurance against Loss or Damage to Property and Loss of Life and Injury to Persons caused by

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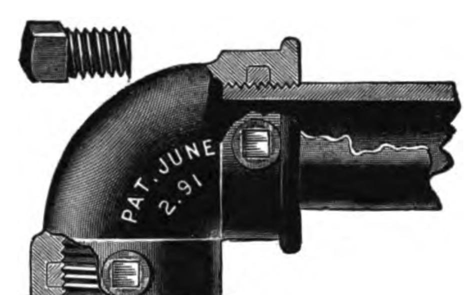
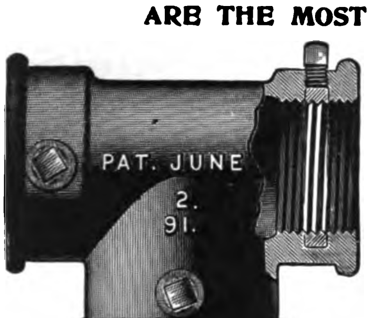
TIGHT JOINT Ammonia Fittings and Flange Unions

ARE THE MOST RELIABLE IN THE MARKET.





These Fittings have proved themselves in the past five years the most **economical** for Ice Machine Piping, and the only ones that insure **NO** leakage of Ammonia or Brine.

We carry a stock of over 60,000 Fittings and Flange Unions, which insures prompt filling of orders.

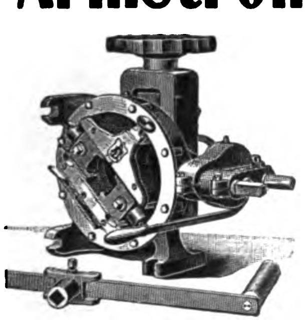
We manufacture ELBOWS, TEES, COUPLINGS, RETURN BENDS, RIGHT and LEFT, and REDUCING FITTINGS, BUSHINGS and FLANGE UNIONS.

More than 500 Plants in the United States are equipped with "Tight Joint" Fittings and Flanges.

TIGHT JOINT CO., 159 Bank Street, NEW YORK CITY.

Armstrong's Pipe Threading and Cutting off Machines

HAND OR POWER
SIZES, 1-8 TO 6 INCHES



New No. 0 Threading Machine.

CUTTING ATTACHMENT ON ALL MACHINES FROM 1 TO 6 INCHES INCLUSIVE

Our No. 0 machine is designed for threading the smaller sizes of pipe—iron or brass—also bolts. Works with great ease and rapidity. Has two speeds, one for pipe ⅛ to 1 inch, the other for pipe 1¼ to 2 inches, inclusive. You change crank from one speed to the other as wanted, and so get rid of turning a great number of times on small pipe.

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For Ammonia and Steam Condenser Service.

WHEELER SURFACE CONDENSERS. WHEELER FEED WATER HEATERS.

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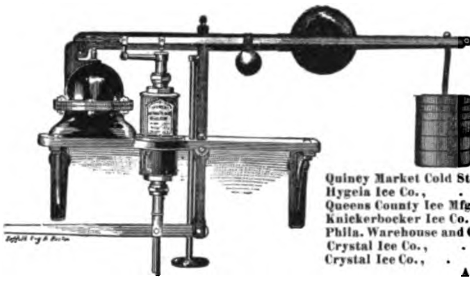

Makes a partial stroke in both directions.
Moving damper by correct principles.

REFER TO THE FOLLOWING USERS:

Quincy Market Cold Storage Co., . Boston, Mass.
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Phila. Warehouse and Cold Stor. Co., Philadelphia, Pa.
Crystal Ice Co., ... Richmond, Va.
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And others.

THE CRYSTAL ICE CO., RICHMOND, VA.
The Spencer Damper Regulator has given perfect satisfaction, exceeding your guarantee in the amount of fuel saved. We have saved money by its use.
C. D. WINGFIELD, *Treasurer.*

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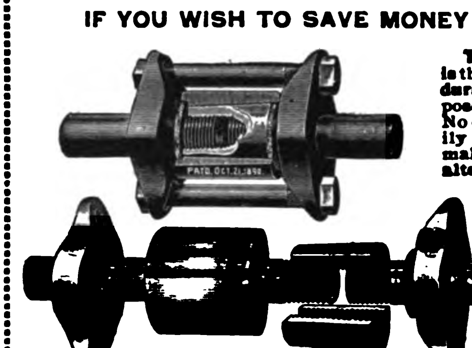
Use the CLIMAX COUPLING

IF YOU WISH TO SAVE MONEY AND LABOR.



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THE CLIMAX COUPLING is the cheapest, best and most durable joint for all purposes, especially ammonia. No coupling can be so speedily attached or detached, making it invaluable for alterations and repairs.

Write for further Information, Testimonials and Prices.

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MANUFACTURER OF
COOLING TOWERS

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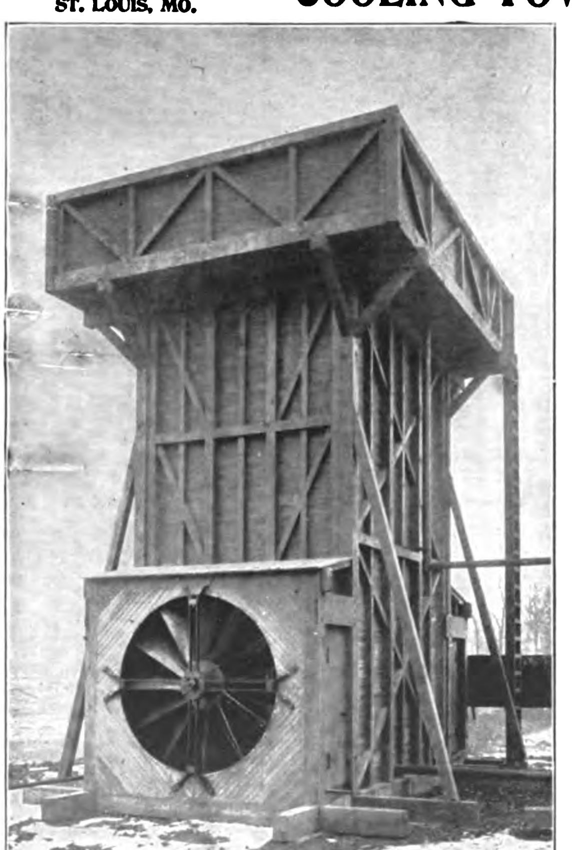

Apparatus for the Re-Cooling of Ammonia and Steam Condenser Water.

SAVES FROM 90 to 95 PER CENT of the Water Required for Condensing and Cooling Purposes.

Owing to the superior construction of the cooling surfaces (about 40 per cent larger than with the Gradirworks, patent Klein) and the most perfect methods of distributing the water, the efficiency of this Cooling Tower is greater than with any other in the market, and the temperatures obtained considerably lower. References from leading firms all over the United States. Information and estimates, etc., cheerfully furnished.

MERRELL MFG. CO.

Manufacturers of **Pipe Threading and Cutting Machines**

11 Curtis St.
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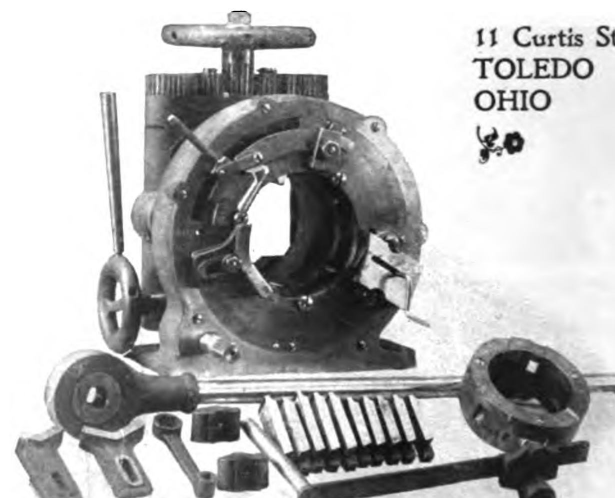

THIS cut illustrates our Portable Hand Pipe Threading Machines. Power is applied by either crank or ratchet. The gears are completely housed from dust, and chips are not accessible to any part of the machine. These machines do better and more rapid work, both in threading and cutting off, than any other hand machine on the market. They have a greater range of work and quicker changes from size to size of pipe.

For full particulars, send for handsomely illustrated catalogue.

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For ICE MAKING and REFRIGERATING MACHINERY and PIPING.

AMMONIA PIPES, VALVES AND FITTINGS.

Old Plants overhauled and remodeled. All sorts of Repairing promptly attended to. Expert advice on new installations, or wherever a plant falls short of its usual capacity. Fifteen years' practical experience in the line of Ice Making and Refrigeration enables me to guarantee satisfaction in every instance. Your correspondence is respectfully solicited.

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Damp Resisting PAINT

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The best Insulation in Cold Storage Rooms. The best Preventive against Rust and Decay on Iron or Wood. No moisture or heat will penetrate through walls coated with R. I. W.

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MANUFACTURERS OF

Ice & Refrigerating Machinery

Of a new and improved pattern; from ½ ton to 15 tons capacity ice making.
We can furnish references from parties who have had our machines in successful operation for ten years.
Write for estimates and prices to our home office.

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Refrigerating and Ice Making Machinery

Built in 20 different sizes, from 2½ to 50 tons. The first machine built in 1894.

OVER 500

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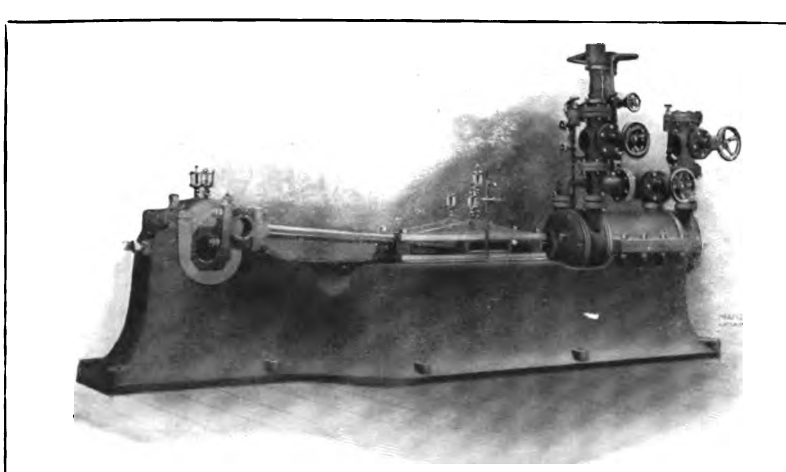

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COILS

OF ALL KINDS,

Ammonia Valves and Fittings.

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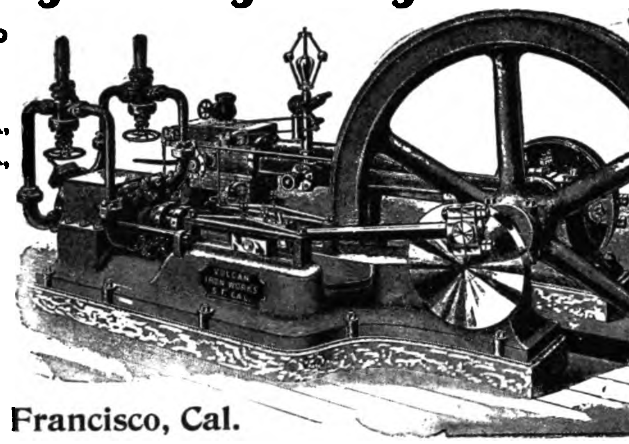
VULCAN Ice Making and Refrigerating Machines

OF ANY DESIRED CAPACITY



ON THE SIMPLEST AND MOST ECONOMICAL SYSTEM

REFERENCES:

100 Machines in— CALIFORNIA, OREGON, WASHINGTON, ARIZONA, NEW MEXICO, BRITISH COLUMBIA, MEXICO, CENTRAL AMERICA, SOUTH AMERICA, HAWAII, PHILIPPINES.

PACIFIC MAIL S. S. CO., - 11 MACHINES.
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Ammonia Piping, Condenser Coils, Ammonia Fittings, Chapman Valves, Mineral Wool, Insulating Paper.

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Graphite Lubrication.

There is no substance known so smooth or so enduring as Dixon's Pure Flake Graphite. It is the best solid natural lubricant ever discovered. It is not affected by heat or cold, acids or alkalies. It is absolutely indispensable to every marine, stationary or locomotive engineer. It will pay you to send for Sample and Pamphlet. No charge.

JOSEPH DIXON CRUCIBLE COMPANY,
JERSEY CITY, N. J.

"Purefiant Cylinder Oil"

makes the recovery of **pure water from exhaust steam** an easy matter. **Clear ice,** free from color or deposit, the result. Write us for information, etc.

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ALBANY GREASE

TEXARKANA, TEX., May 14, 1898.

ADAM COOK'S SONS,
313 West St., New York, N. Y.

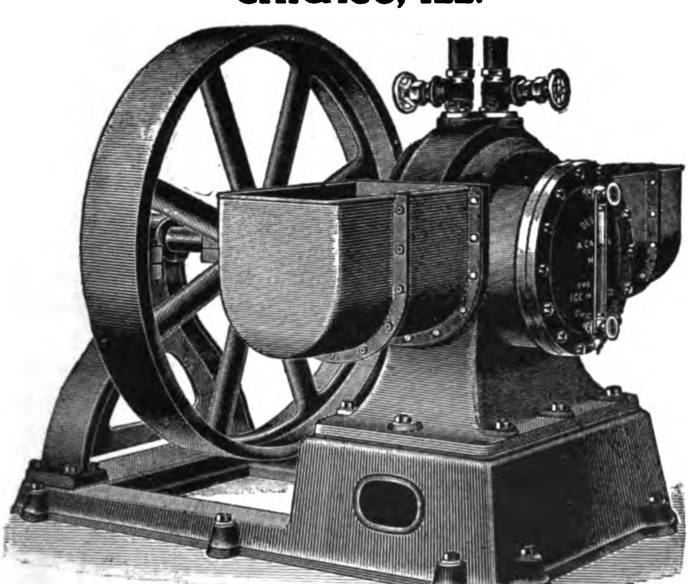
Gentlemen: Please ship us, fast freight—
One 50-pound can "X" Albany Grease.
One 50-pound can No. 2 Albany Grease.

This is our third season now, and would not use anything else. We find the X, XX and No. 2 will fill any occasion. Our last shipment arrived late, and we had a refractory pin that was running hot on an excellent brand of grease, but the moment we dosed it with yours she cooled down and went to work the remainder of the season without the least bother. We are somewhat surprised that more of it is not in use in this section, especially on ice machines, where the very highest duty is required, and a shut-down or slack-up of a machine, on account of hot bearings, would pay for five years of this compound.

Yours truly, TEXARKANA ICE COMPANY,
F. M. POLHAMIUS, *Sup't.*

The Healy Ice Machine Co.

CHICAGO, ILL.



MANUFACTURERS OF THE LATEST IMPROVED

ICE MACHINES

IMPROVEMENTS INCLUDE:

SIMPLICITY, ECONOMY AND DURABILITY.

THE BEST MACHINE FOR

Ice Making, Hotels, Clubs, Restaurants, Packers, Butchers, etc.

CAPACITY, ONE TO FIFTY TONS.

Machines in successful operation in Canada, the United States and South America

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The Ideal NEVER GIVES ANY TROUBLE

WHY?—By our automatic oiling device all parts are thoroughly lubricated.

Every part is made of best material.

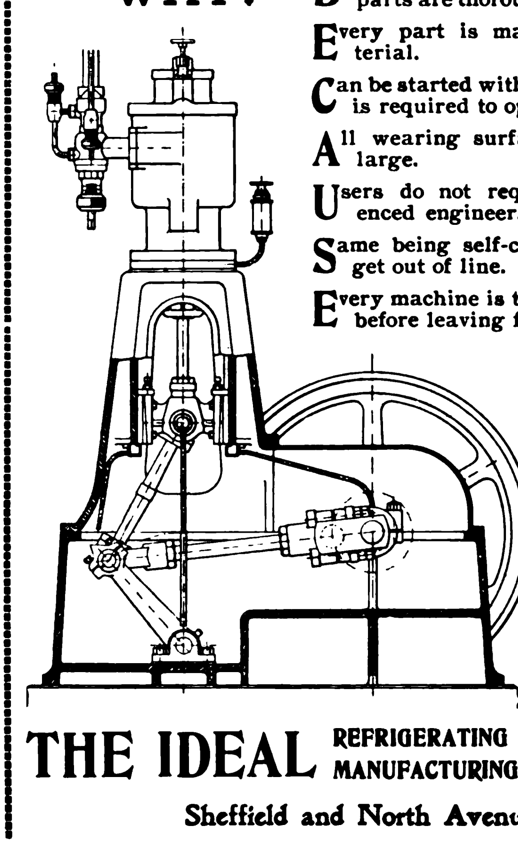
Can be started with less power than is required to operate it.

All wearing surfaces are amply large.

Users do not require an experienced engineer.

Same being self-contained, cannot get out of line.

Every machine is thoroughly tested before leaving factory.



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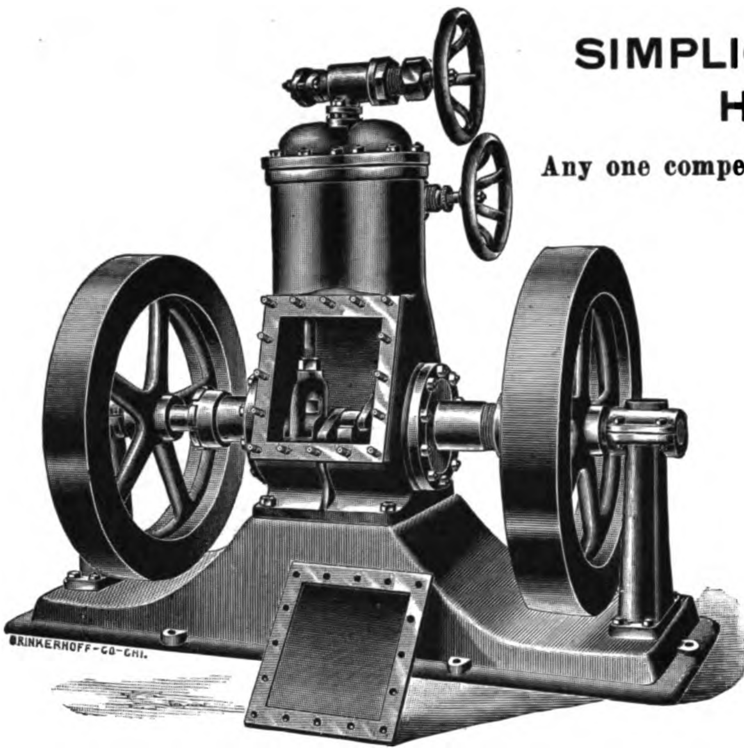
THE IDEAL REFRIGERATING AND MANUFACTURING CO.

Sheffield and North Avenues, CHICAGO

CHALLONER Perfected Ice and Refrigerating Machines



THREE-TON COMPRESSOR.

**SIMPLICITY, DURABILITY,
HIGHEST EFFICIENCY.**

Any one competent to operate motive power can operate them.

FLOHR-WALTER CANDY CO.
Manufacturing Confectioners, 114, 116, 118 Walnut St.

St. Louis, August 16, 1897.

Geo. Challoner's Sons Co., Oshkosh, Wis.

Gentlemen: We have your letter of August 14. In reply we are pleased to report that our refrigerating plant is working very satisfactorily. Our chocolate department, cooling room and cold water tanks have given us the required temperature during the hottest kind of weather, and we shall be pleased to testify to the efficiency of your system at any time. Yours respectfully,

FLOHR-WALTER CANDY CO.

We build and install plants from 1 ton up to 25 tons refrigeration.

SATISFACTION GUARANTEED OR NO PAY.

WE WANT YOUR BUSINESS.
WRITE US FOR ESTIMATES.

GEO. CHALLONER'S SONS CO. ENGINEERS AND FOUNDERS . . . 33 Oscoola St., OSHKOSH, WIS.

The BUFFALO Refrigerating Machine Co.

New York Office
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141 Broadway

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BUFFALO, N. Y.

Ice Making and Refrigerating Machinery

BUILDERS OF THE IMPROVED

BUFFALO
VERTICAL
DIRECT-ACTING
Ice and Refrigerating
MACHINE

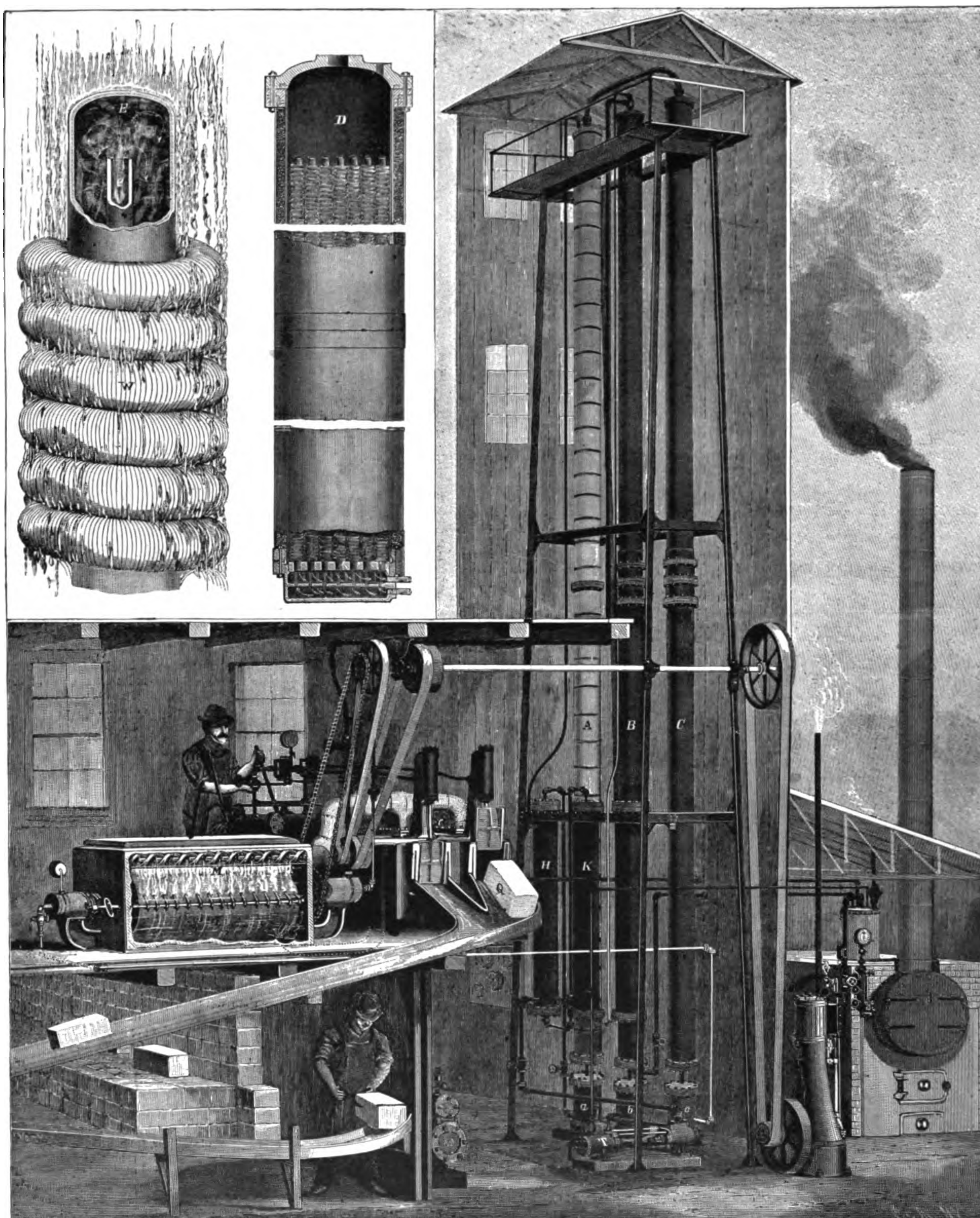
THE SIMPLEST, MOST DURABLE, SUBSTANTIAL AND EFFICIENT MACHINE IN THE MARKET.

Full particulars estimates, illustrated catalogue, list of machines in operation, etc., furnished upon application.

THE ARCTIC

The Regealed Ice Machine

MANUFACTURED SOLELY BY ❧ ❧ ❧ **D. L. HOLDEN** 1336 BEACH ST. ❧ ❧ PHILADELPHIA, PA.



Makes Ice at 50 Cts. a Ton

THE FRUIT OF THIRTY-FIVE YEARS OF EXPERIENCE. AN ABSOLUTELY NEW WAY OF MANUFACTURING ICE. A COMBINATION OF THE COMPRESSION AND ABSORPTION AMMONIA SYSTEMS

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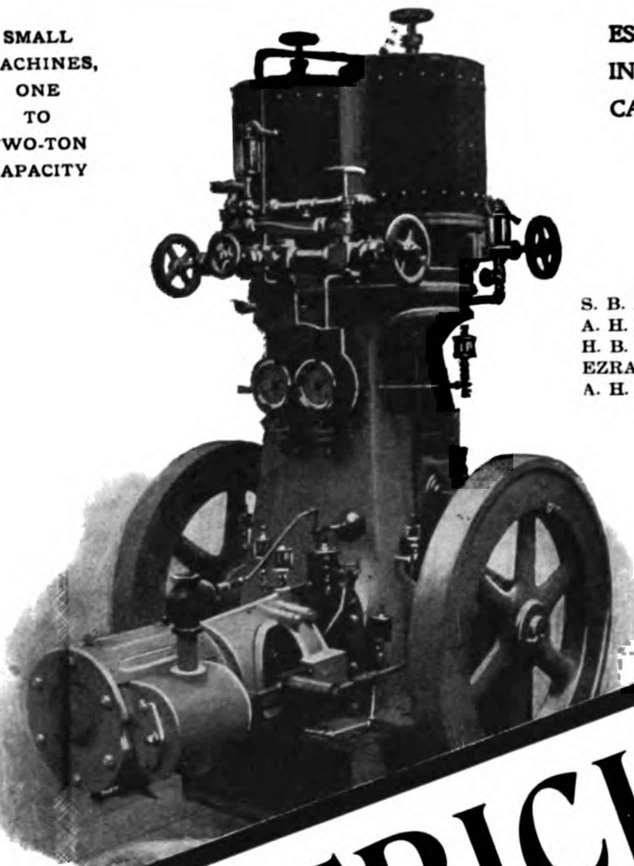
SOLE MANUFACTURER OF THE **REGEALED ICE MACHINE**

SMALL MACHINES, ONE TO TWO-TON CAPACITY



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INCORPORATED 1885.
CAPITAL, $1,000,000.

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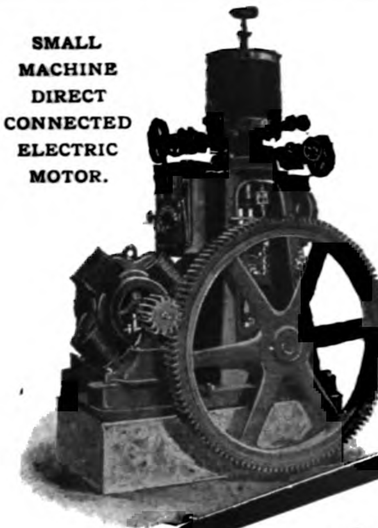
A. H. HUTCHINSON, Manager Ice and Refrigerating Dep't.

SMALL MACHINE DIRECT CONNECTED ELECTRIC MOTOR.



FRICK COMPANY

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...WE... BUILD

ICE PLANTS—Can or Plate System. Special Machinery for Breweries, Hotels, Creameries, Skating Rinks.

REFRIGERATING PLANTS—Direct or Brine System. For Cold Storage and Refrigeration in any of their branches.

CORLISS ENGINES—Condensing and Non-condensing. Single Cylinder and Double to Quadruple Compound. Forty to 3,000 H. P. For all manufacturing purposes.

AMMONIA VALVES, FLANGES and FITTINGS—of our improved design and best material, same as those supplied with our regular standard plants.

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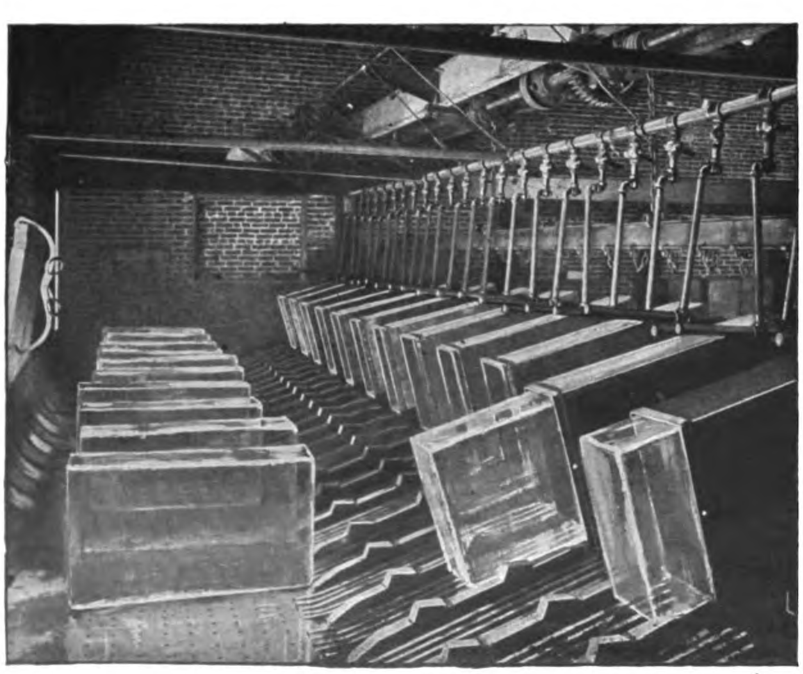

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Engineers

REFRIGERATING MACHINERY

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Refrigerating Expert and Consulting Engineer

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Experience Has been in the refrigerating business sixteen years. Received instructions in Germany up to his 26th year in the practical and theoretical workings of engineering. For thirteen of the sixteen years he was with the De La Vergne Refrigerating Machine Co., occupying with them a prominent position as expert constructor, erector and superintending engineer. For two years he was secretary of the Ruemmeli & Siebert Refrigerating Machine Co. Established himself in business on March 1, 1898. Besides furnishing extensive expert advice, he has acted as consulting engineer in the erection of the 200-ton refrigerating machine with condenser for the Columbia Brewing Co., St. Louis; and the two 200-ton refrigerating machines (700,000 cubic feet of cold storage), and a 120-ton ice plant for the Mound City Ice and Cold Storage Co., St. Louis.

References Adolphus Busch, St. Louis, Mo.; The De La Vergne Refrigerating Machine Co., New York; Messrs. Kupferle & Bros., St. Louis, Mo.; The Mound City Ice and Cold Storage Co., St. Louis, Mo.; Columbia Brewing Co., St. Louis, Mo.; American Brewing Co., St. Louis, Mo.; Mound City Packing Co., St. Louis, Mo.

Practical Articles from Mr. Siebert's pen appeared in *Ice and Refrigeration*, in the October, November and December, 1898, and in the January, February, March and April, 1899, numbers. The article describing the plant of the Mound City Ice and Cold Storage Co., of St. Louis, and another advising how to determine the kind of machinery to purchase, are contained in the November number of *Ice and Refrigeration*.

Ice Making and
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"BOYLE" Compression
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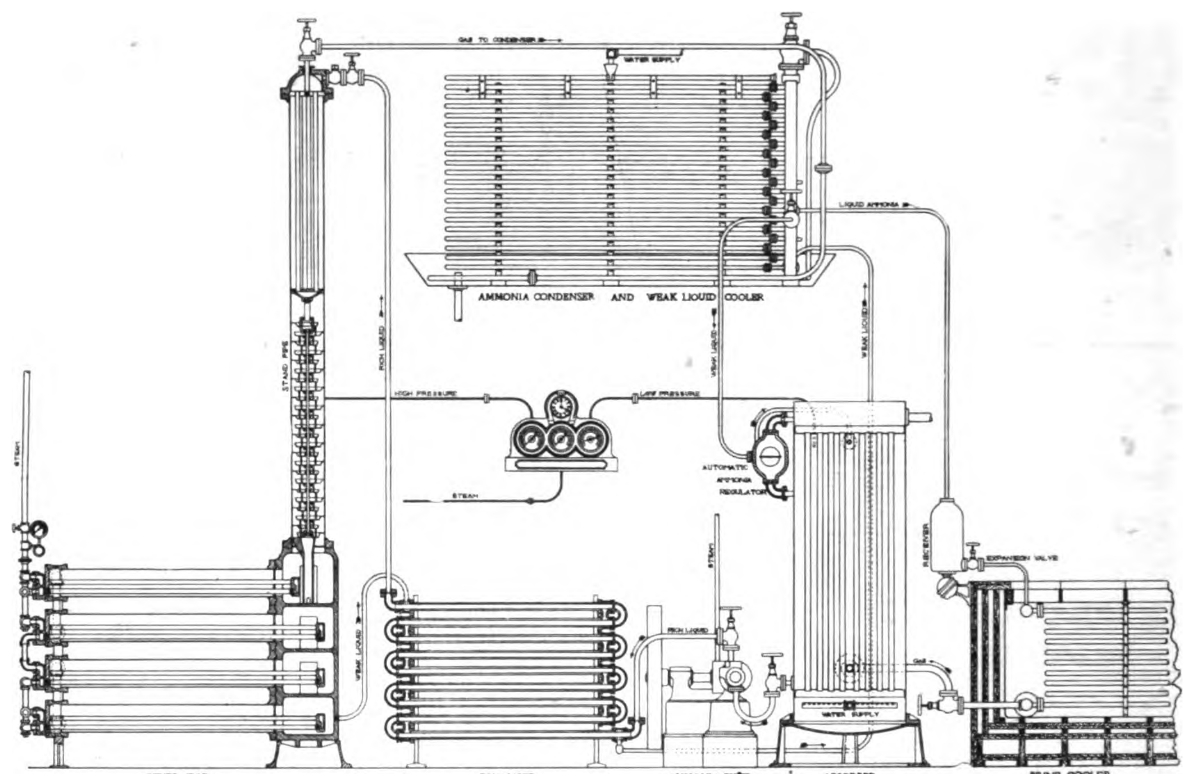

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LIMA PURE ICE CO., Lima, Ohio,	50-ton.
PEOPLES' ICE AND COLD STORAGE CO., Owensboro, Ky.,	45-ton.
T. H. MOORE, Montgomery, Ala.,	30-ton.
ERNEST HOFFMAN, Lexington, Mo.,	25-ton.
MAYFIELD COAL AND ICE CO., Mayfield, Ky.,	20-ton.
J. E. BLACKBURN, Boyce, La.,	18 ton.
SIDELL ELECTRIC LIGHT, ICE AND COLD STORAGE CO., Sidell, Ill.,	10-ton.
JOS. LODGE, South Pittsburg, Tenn.,	10 ton.

ALSO ADDITIONS TO THE FOLLOWING PLANTS:

DIAMOND ICE AND COLD STORAGE CO., Seattle, Wash.,	100 ton.
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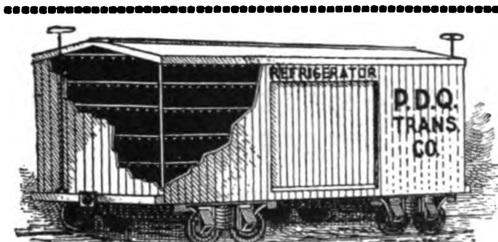

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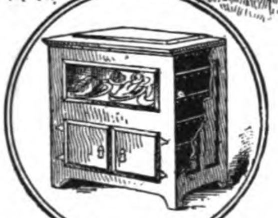

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Lining Ice and Cold Storage Houses

CONTAINS MORE INSULATING VALUE THAN ANY OTHER MATERIAL. ✠ ✠ ✠ ✠
WILL LAST FOREVER. ✠ ✠ ✠ ✠ IT IS LIGHT IN WEIGHT AND UNINFLAMMABLE.
IT CONTAINS MORE DEAD AIR THAN TWENTY LAYERS OF SHEATHING PAPER.

Liquid Air Refrigeration and Power Co.

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ESTABLISHED THIRTY YEARS.
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LEAVES NO SMELL, TASTE OR COLOR IN ICE.

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OVER 1,250 MACHINES SUPPLIED of which nearly 700 are fitted on board ship.

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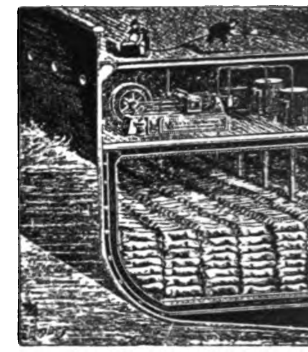

—TESTIMONIAL—

THE CO-OPERATIVE WHOLESALE SOCIETY, LTD., 1 Balloon St., Manchester.
JAS. FERNIE, Esq. (Agent for J. & E. HALL, LTD.) October 13, 1899.

DEAR SIR: In reply to your letter of October 6, respecting the Refrigerating Machinery which we have had from Messrs. J. & E. Hall, Ltd., for our Irish Creameries, we have pleasure in stating that we have found the machines very efficient, and they have given us every satisfaction. They quite come up to the guarantee you originally gave us as to their capabilities. There is no danger in the working of the machines, which are so simple that no skilled hand is required to take charge of them. Another satisfactory feature is the absence of smell.

Yours truly, pro Society, Signed, J. BRODRICK.

THE ABOVE SOCIETY WILL SHORTLY HAVE 17 OF HALL'S PATENT CARBONIC ANHYDRIDE REFRIGERATING MACHINES AT WORK, HAVING JUST ORDERED 12 MORE MACHINES FOR THEIR CREAMERIES IN IRELAND. OVER 100 MACHINES SUPPLIED FOR DAIRIES IN ENGLAND AND COLONIES.

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5 SUBJECTS FULL OF.... INTEREST AND ECONOMY

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ITS ECONOMY

ITS RELIABILITY

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OUR
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ARE CONSTRUCTED WITH A VIEW TO A MINIMUM OF LABOR, THEREBY INCREASING THE

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DO NOT NEGLECT TO ASK US FOR BIDS BEFORE PLACING YOUR ORDERS

IF YOU WOULD USE OUR
DISTILLING APPARATUS

YOUR WATER BILL WOULD BE LOWER

YOUR ICE WOULD BE PURER

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A HAPPY ICE MAN

WHY DOES OUR
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BUSINESS CONTINUE TO INCREASE?

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OUR CUSTOMERS ARE CONVINCED THAT FOR A SLIGHT ADDITIONAL EXPENSE THEY CAN PROCURE A FITTING THAT WILL GIVE MANY TIMES THE SERVICE OF A SO-CALLED

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IF YOU WANT A GOOD TOOL

WE HANDLE ONLY THE MOST DURABLE, AND OUR LIST OF USERS IS CONSTANTLY INCREASING

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tion of the buildings from the first floor to the roof. the foundation was constructed of rubble stone, laid in best quality Portland cement mortar, and cemented on both inside and outside, with a thorough facing of cement to hold the same water tight. Courses of 4-inch soft water-tiling were placed below the surface in such a manner as to absorb and thoroughly drain all moisture from the earth below the building, and over the earth a ground footing of cinders or locomotive breeze, from eighteen inches to two feet thick was tamped in to provide an insulated footing below the floors. The basement proper is provided with a concrete or cement floor, possibly later to be used for cold storage purposes in addition to the space provided on the three main floors of the building. The walls of the cold storage house proper were constructed of brick, while the engine and tank room adjoining, also of brick construction, are entirely independent of the storage house, in order to guard against the possibility of fire entering the main structure from the boiler or engine room.

Fig. 1 shows the front elevation of the building, while Fig. 2 shows the east elevation; Fig. 3 the longitudinal section; Fig. 4 the cross-section; Fig. 5 the first floor plan; Fig. 6 the second floor plan; Fig. 7 the third floor plan, and Fig. 8 the attic and roof plan. By referring to the views showing the longitudinal and cross-sections it will be seen that the timber work and floor constructions have been designed with due attention to the factor of the considerable weights usually carried in such buildings, and that care has been taken to provide for ample strength, as well as for judicious distribution of loads.

J. W. PADDOCK, GENERAL MANAGER, TOLEDO COLD STORAGE CO., TOLEDO, OHIO, AT HIS DESK.

The basement, on the start, will not be divided up into separate cold storage rooms, but it is anticipated that the growing demands for cold storage in Toledo will shortly compel the company to equip this part of the building for the accommodation of cold storage commodities, and with this prospect in view the company has arranged for that possibility in advance by carrying the elevator hallway and shaft down to the

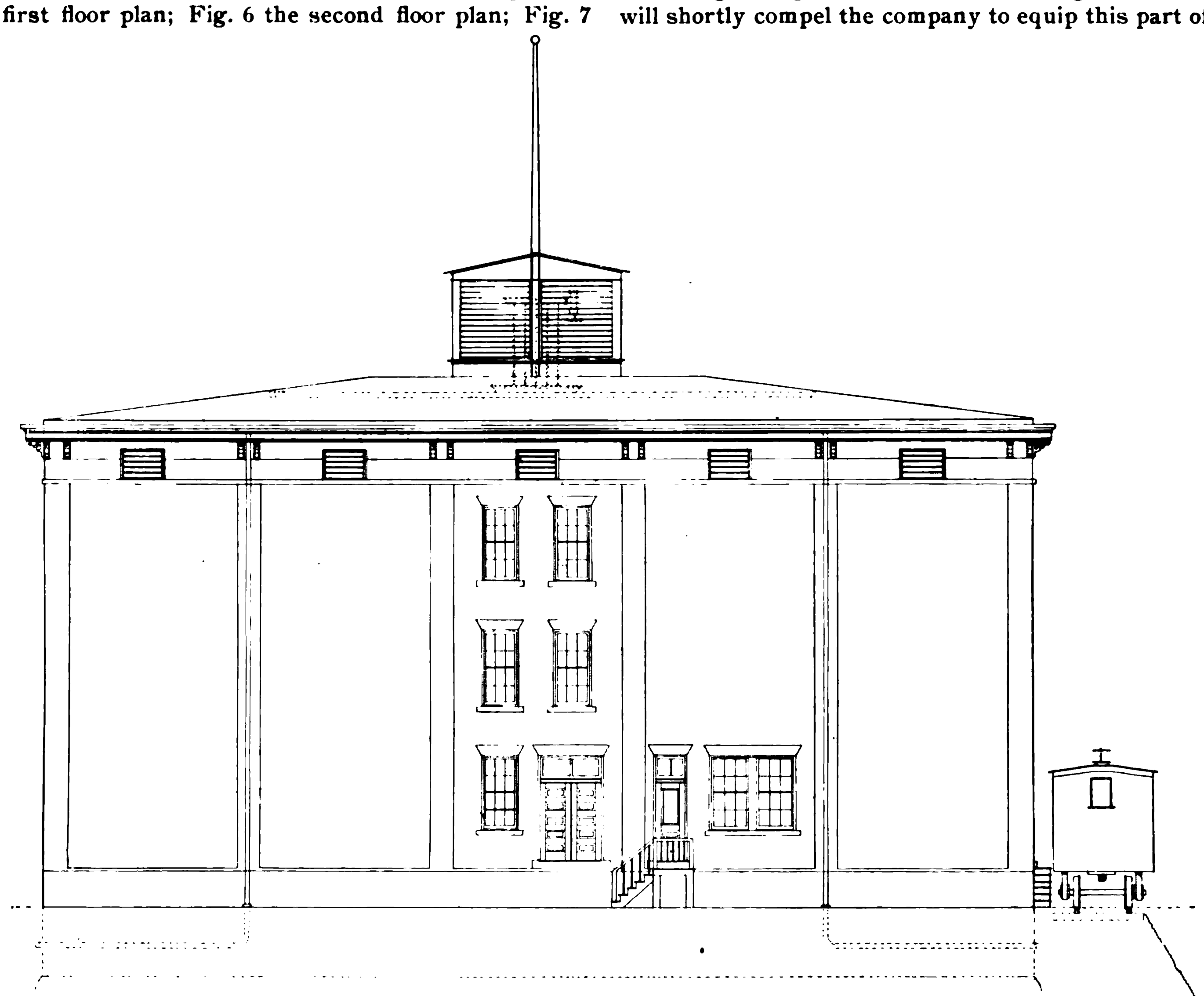


FIG. 1—FRONT ELEVATION, TOLEDO COLD STORAGE CO.'S NEW WAREHOUSE, TOLEDO, OHIO.

basement, and they have given attention to the thorough insulation of the walls of the basement, as well as those of the walls and partitions of the floors above.

Fig. 5, the first floor plan, shows the arrangement of the offices, receiving room, hallways, two large and one small storage room, and two sharp freezing compartments, besides the elevator, scales and receiving and discharging doorway for wagon load merchandise. This plan further shows the arrangement of the boiler house, engine room, freezing tank, filtering and cooling tanks and ice storage rooms. At present the boiler room is equipped with two 60-inch by 18-foot steel tubular boilers, 150 horse power each, furnished by Brownell & Co., Dayton, Ohio, and fitted with all of the latest modern improvements for the economical combustion of the cheaper grades of fuel. The boilers were erected after plans and specifications furnished by the Hartford Steam Boiler Inspection and Insurance Co., of Hartford, Conn. The feed water heater was furnished by I. B. Davis & Son, of Hartford, Conn. The engine room contains one 35-ton Consolidated refrigerating machine, with 16×30 horizontal Corliss engine, and two 10×30-inch single-acting ammonia compressors, and for the present a second machine of the Empire pattern has been erected and held in reserve in case of emergency, later to be taken out and replaced with a duplicate of the Consolidated machine. The freezing tank contains 224 300-pound ice cans, furnished by Marlin & Co., of Pittsburg, Pa., and is equipped with all of the latest modern improvements in the way of brine circulating, pneumatic hoisting and thawing and dumping attachments and can filling apparatus. The coils for the brine tank were supplied by Farrell & Rempe Co., of Chicago. A Morris centrifugal direct connected brine pump, made by Morris Machine Works, Baldwinsville, N. Y., has been put in for circulating brine in the freezing tank. This freezing tank is insulated by twelve inches of granulated cork, furnished by the Nonpareil Cork Co., of New York, confined by double thicknesses of board, with paper between. The fore-cooling tank is insulated in the same manner. Chloride of calcium, supplied by the Eureka Calcium Works, of Pomeroy, Ohio, is used to make the brine. The steam condenser is of the double-pipe pattern. Both steam and brine pipes are insulated with Keasbey & Matteson pipe coverings. New fittings, furnished by the Fred. W. Wolf Co., of Chicago, were put on the ammonia condensers.

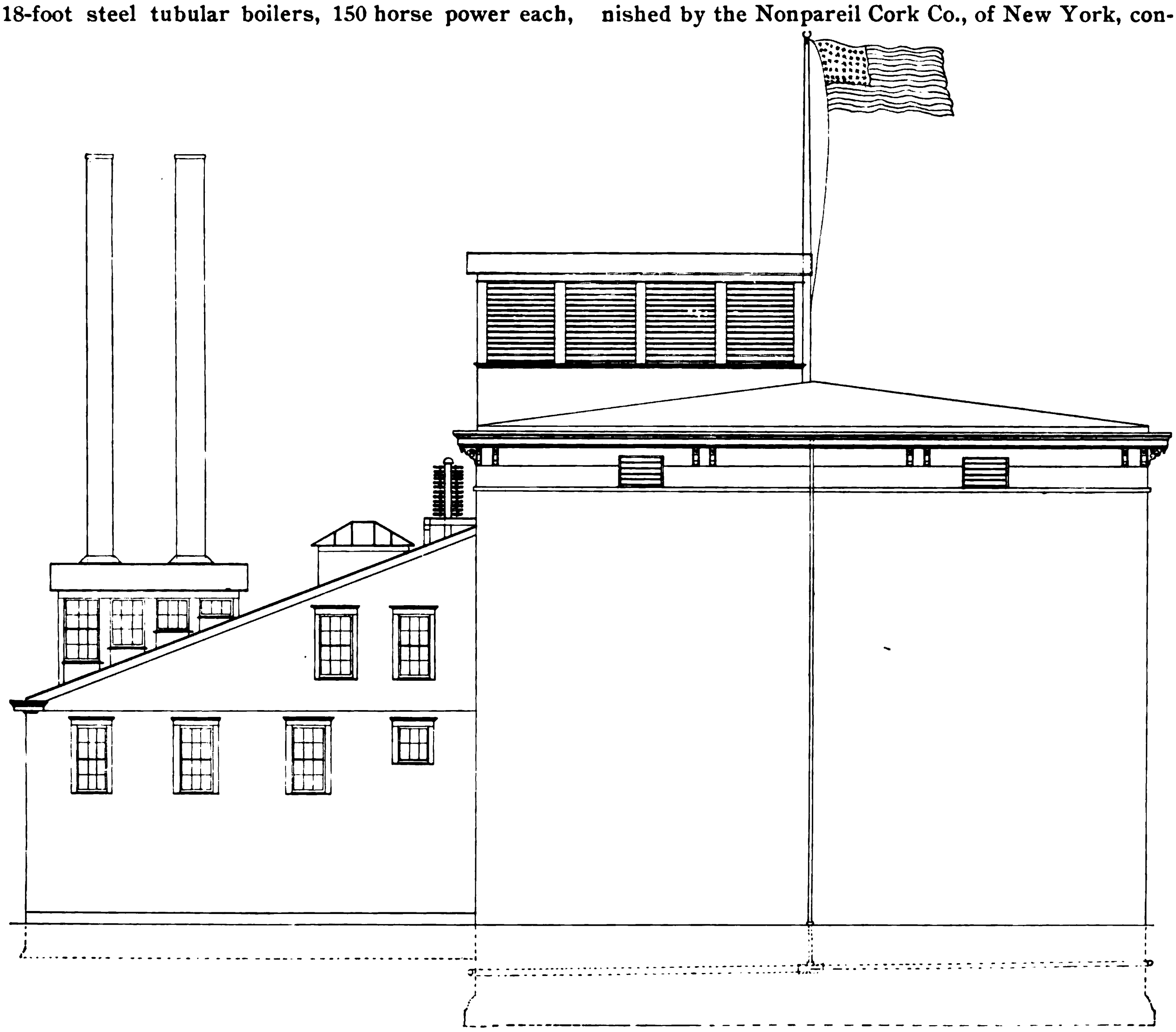


FIG. 2—EAST ELEVATION, ICE PLANT AND COLD STORAGE WAREHOUSE—TOLEDO COLD STORAGE CO., TOLEDO, OHIO.

The ice storage room will be refrigerated to a temperature below freezing point, so as to maintain the ice in storage in the best possible condition. Below the ice storage room an apartment has been fitted up

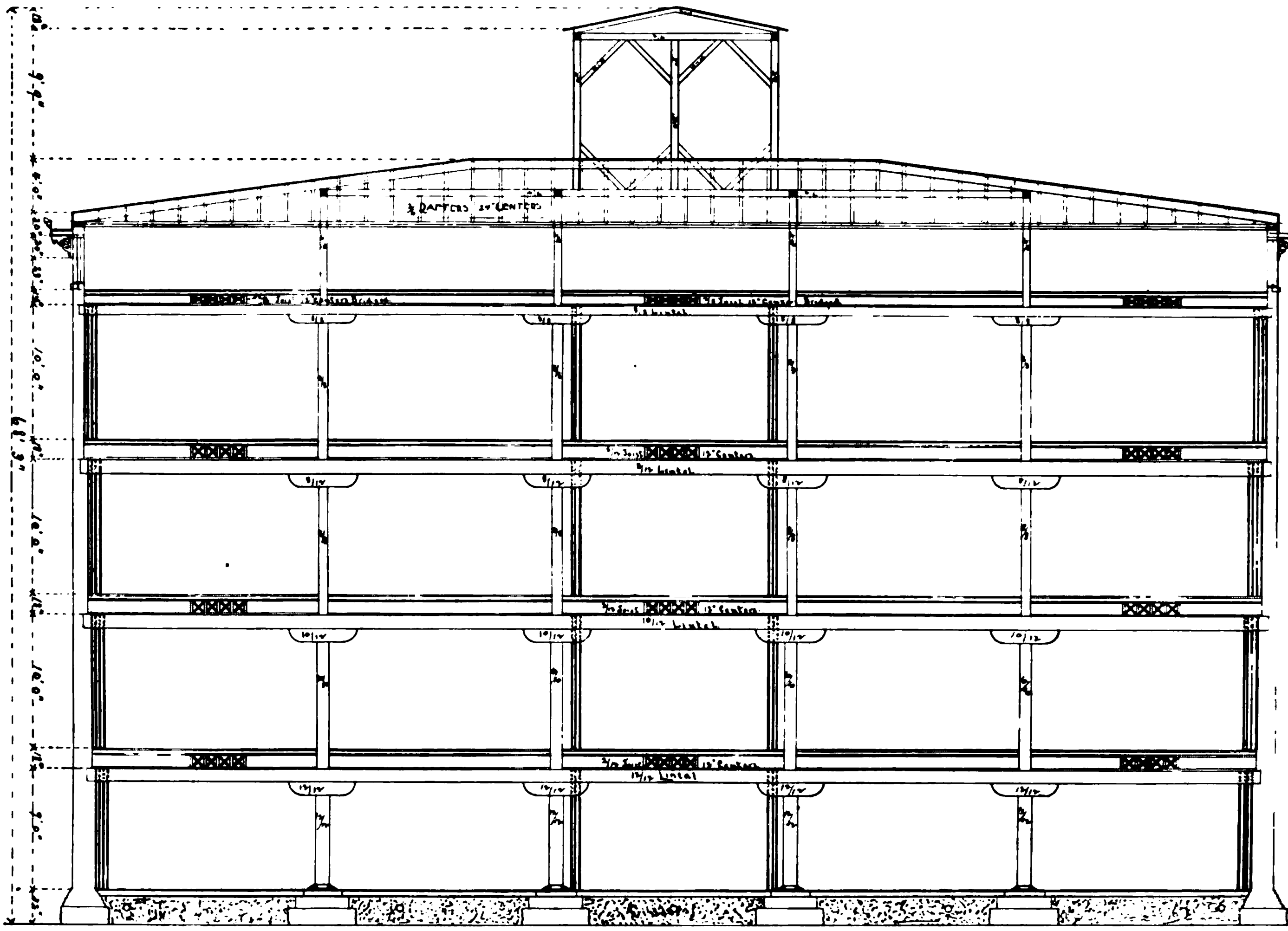


FIG. 3—LONGITUDINAL SECTIONAL VIEW, TOLEDO COLD STORAGE CO.'S NEW WAREHOUSE.

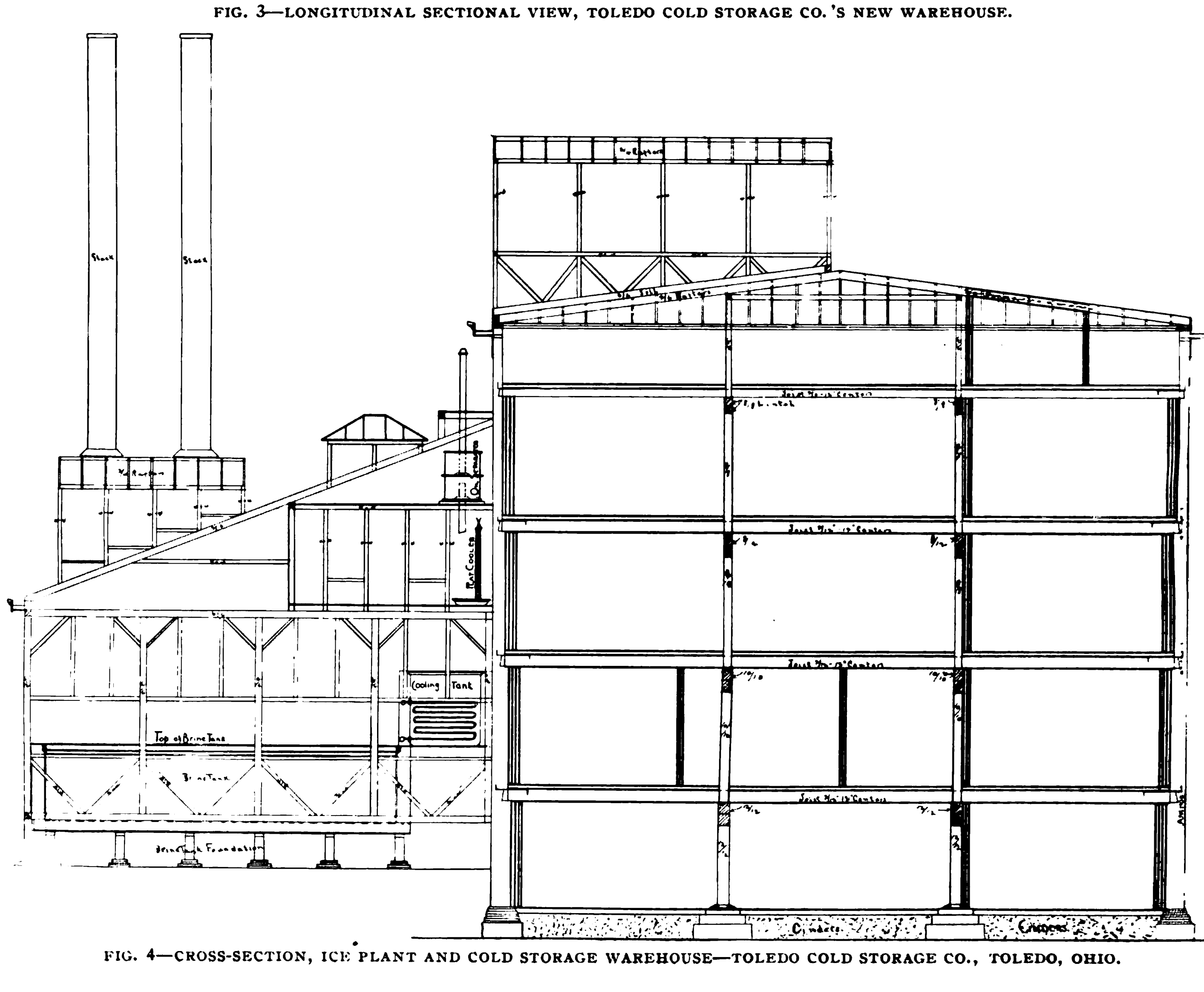


FIG. 4—CROSS-SECTION, ICE PLANT AND COLD STORAGE WAREHOUSE—TOLEDO COLD STORAGE CO., TOLEDO, OHIO.

to accommodate four Westerlin & Campbell's patent brine coolers, each eight pipes high and twenty-four feet long, in which the brine for distribution in the cold storage room pipes will be cooled, and it has been arranged to have the coolers for the cold storage rooms, and those for the sharp freezers, operated entirely independent of each other, so that brine of differing temperatures may be circulated from the coolers to the storage and freezing rooms. The plant is further equipped with a complete distilling apparatus of sufficient capacity to not only produce enough distilled water for ice manufacturing purposes, but also to supply the residents of Toledo with distilled water, should the demand for that commodity warrant the company in embarking in the trade in connection with their other business.

Figs. 6 and 7 show the second and third floors divided similarly, having two large cold storage rooms, with a corridor between on each floor, which later, should the conditions of trade demand, may be divided into six separate rooms on each floor at the lines shown by the columns and girders. This has been taken into consideration in the possible event of a diversity of goods being received, requiring separate compartments for different classes of goods, and the construction of the building is such that these divisions may be quickly made by running partitions across the large rooms at the points indicated.

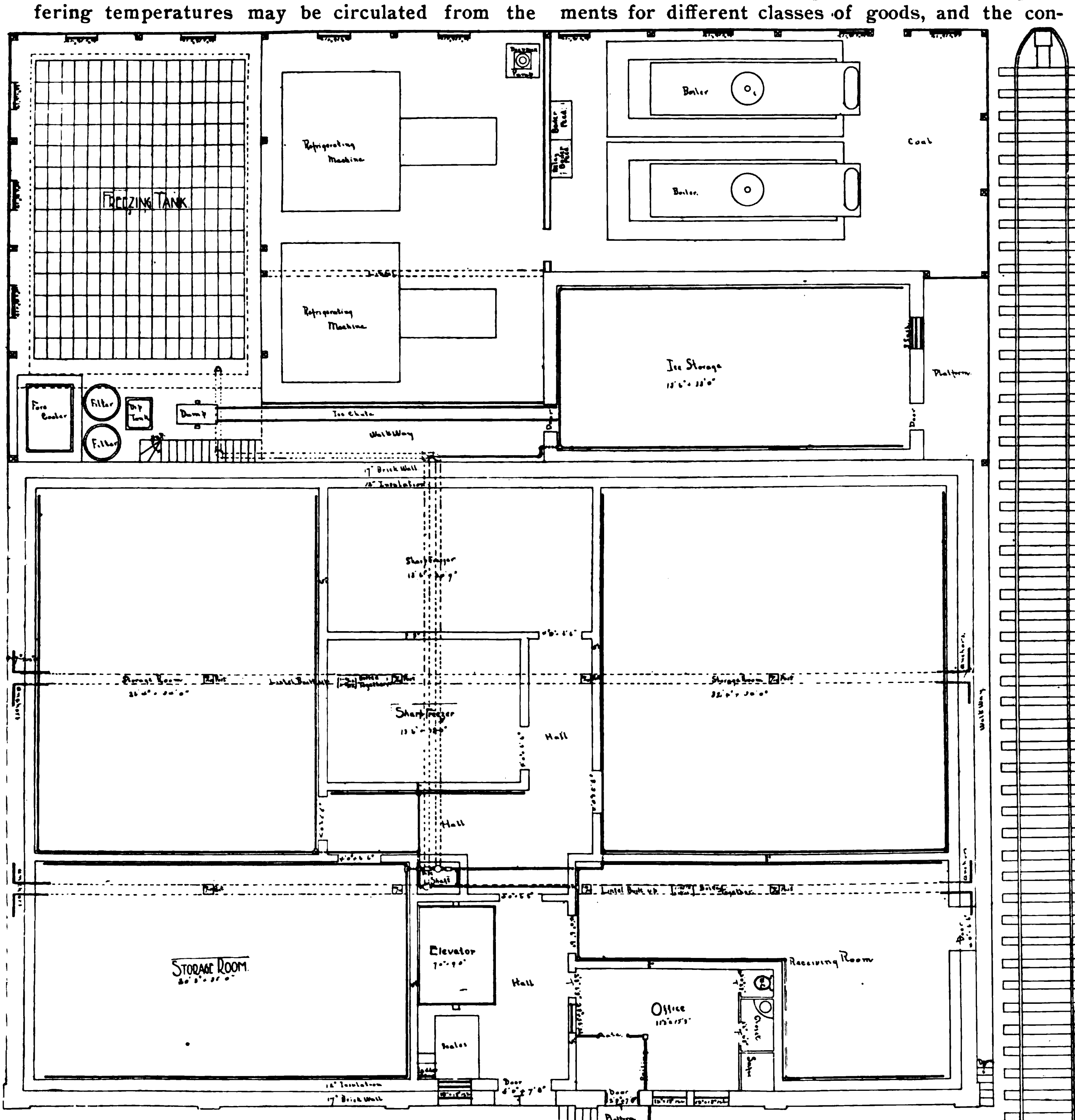


FIG. 5—FIRST FLOOR PLAN, ICE PLANT AND COLD STORAGE WAREHOUSE—TOLEDO COLD STORAGE CO., TOLE DO, OHIO.

The plan of ventilation is to insulate the room in which the Westerlin & Campbell brine coolers stand, and utilize the outside cooling surfaces of same as surface over which to blow the fresh air, thus cooling it before forcing it through the air ducts into the rooms; and leading from each room will be other air

ducts, to allow old, stale air to escape through openings both at floor and ceiling lines, thus getting rid of light and heavy gases. The air will be forced into this cooling room, and on through the ducts to any desired room, by means of an electric fan placed at the inlet for fresh air in the cooling chamber. The fan is a 35-inch, A. B. C. style, furnished by the American Blower Co., of Detroit, Mich.

It is intended to install Richie's thermophone in the entire building, with indicator in the office, so that the manager can keep tab on his temperature man, and keep a record on his own account without having to visit each separate room.

Fig. 8 shows the attic loft and roof lines, and the location of the ammonia condenser house, at the highest point of the structure. It will be noted that ample space is allowed in the attic, with first-class ventilation, to provide against effect of the sun's rays.

For insulation, the brick walls were first given on the inside a thorough coating of brick filling paint, to close all pores, providing a surface which will prevent, as far as possible, leakage of warm air through the walls. Inside of the brick work, the walls are insulated by means of dead air spaces, and constructed with double boards, and double waterproof Neponset red rope insulating paper, furnished by F. W. Bird & Son of East Walpole, Mass. First, next the brick wall, is placed a layer of Cabot's insulating "quilt" made by Samuel Cabot, Boston, Mass. All dividing partitions throughout the entire cold storage building are constructed in the same manner.

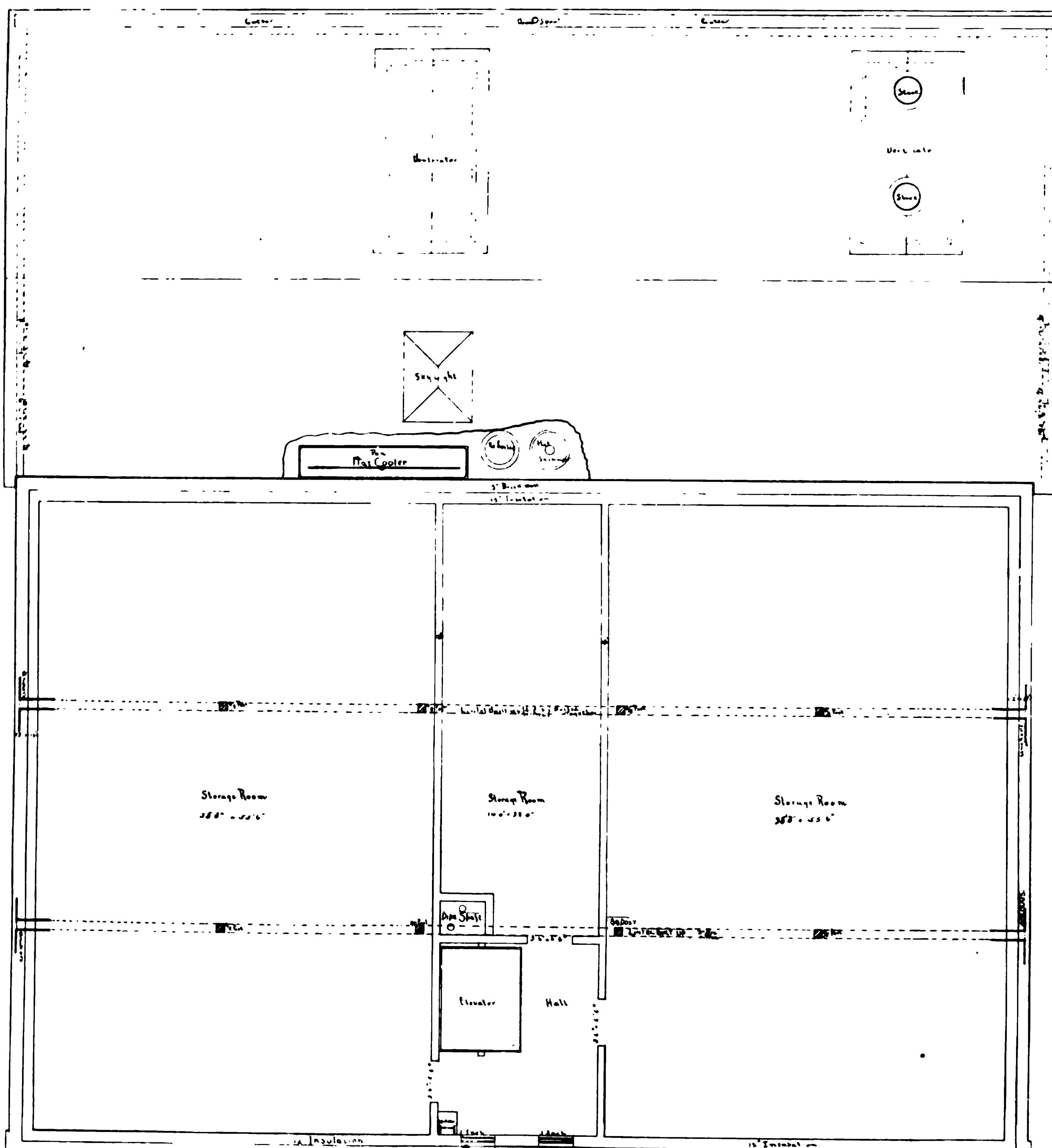


FIG. 6—SECOND FLOOR PLAN, TOLEDO COLD STORAGE CO.'S NEW WAREHOUSE, TOLEDO, OHIO.

The piping of the cold storage and freezing compartments is so arranged as to allow for utilizing as much or as little of the cooling surfaces as may be found necessary to regulate and control the temperatures to any desired degree, and the pipes are

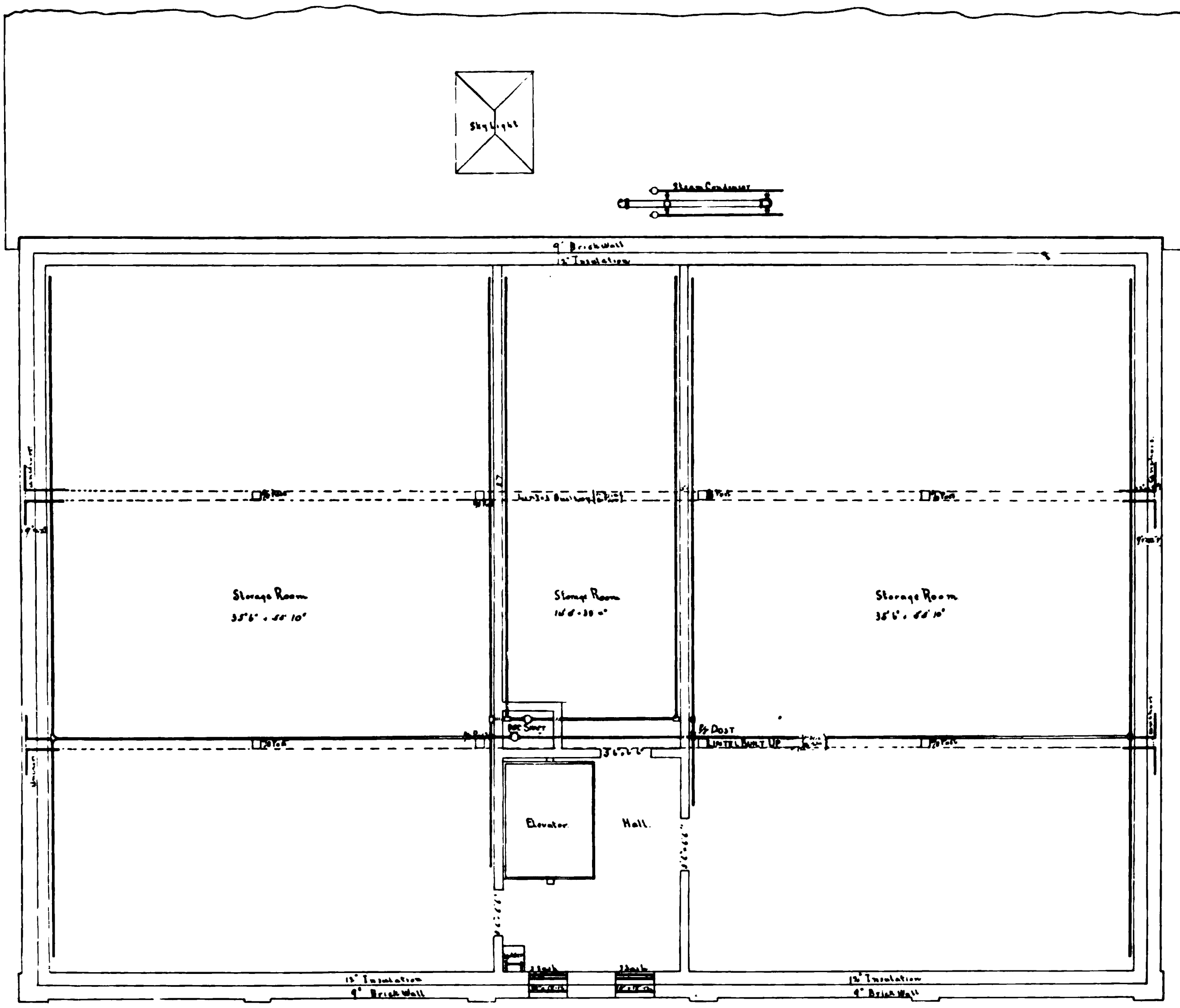


FIG. 7—THIRD FLOOR PLAN, TOLEDO COLD STORAGE CO.'S NEW WAREHOUSE, TOLEDO, OHIO.

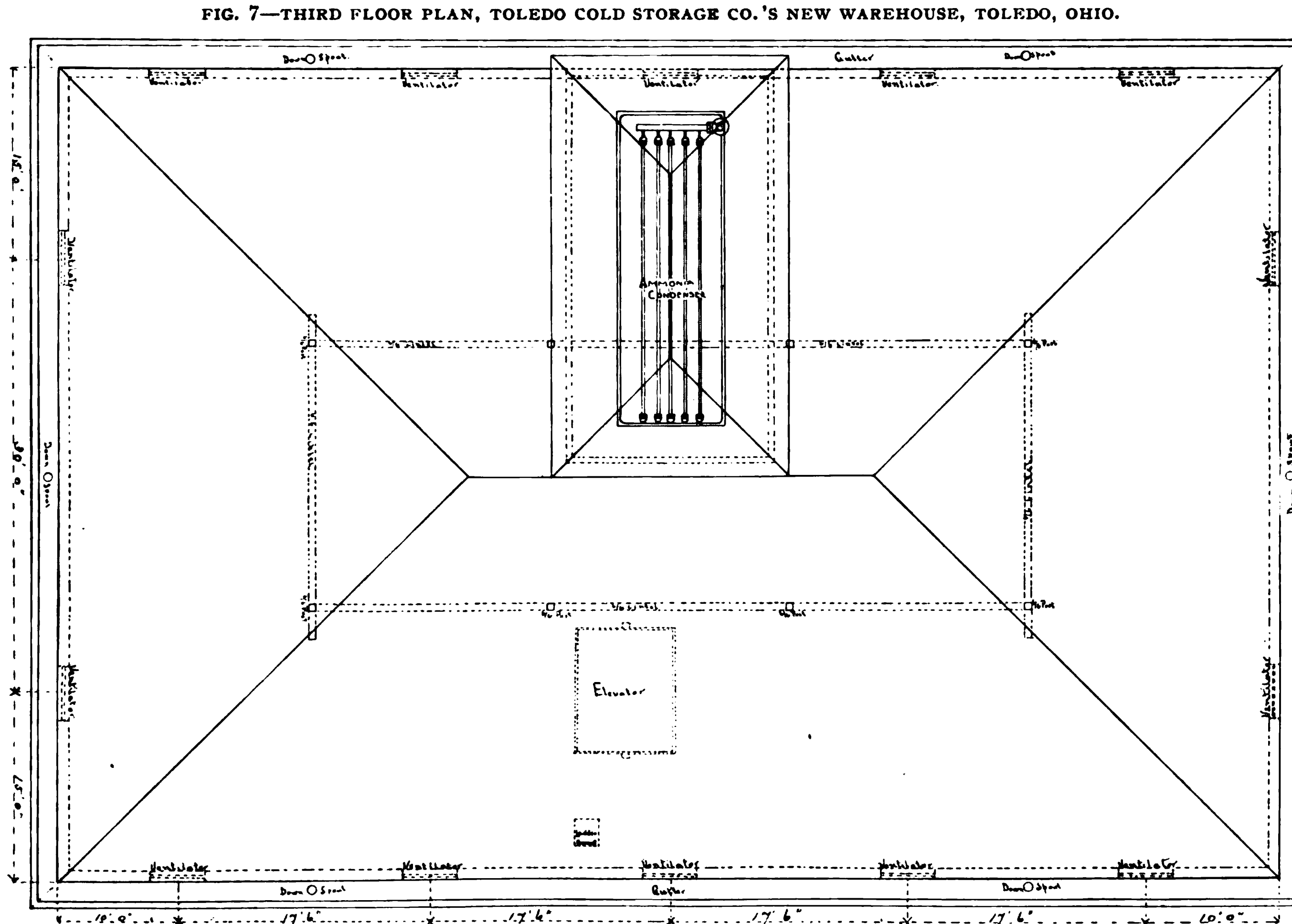


FIG. 8—ATTIC AND ROOF PLAN, TOLEDO COLD STORAGE CO.'S NEW WAREHOUSE, TOLEDO, OHIO.

located in a manner making it impossible for dripping from the pipes to fall on any of the goods in storage, as the pipes are located around the side walls, and are covered with air ducts provided with adjustable shutters, to enable the directing of the cold air currents to any desired part of each room.

All floors and ceilings are thoroughly insulated, and the floors provided with double courses of waterproof paper, to prevent possibility of damage to goods in rooms below in case of leakage of liquids from defective cooperage, and also to permit of thorough scrubbing out in case such should at any time become necessary.

It is further intended that the interiors of all the rooms shall be thoroughly whitewashed, and that the whitewashing shall be renewed each time the rooms are discharged of a season's storage of goods, or whenever necessity may demand that such should be done.

The company has installed its own water works plant with an artesian well and using a Cook deep well pump, made and supplied by A. D. Cook, Lawrenceburg, Ind. They will also have their own independent electric equipment for lighting the plant and for operating the fans. A direct acting hydraulic elevator has also been put in.

Taking all in all, the plant of the Toledo Cold Storage Co. will be complete, and modern in construction, with its 300,000 cubic feet of cold storage space, and Mr. J. W. Paddock, the genial general manager of the company, is to be congratulated upon the fact that he has succeeded in providing against every contingency likely to be met with. The company is spending a considerable amount of money in constructing a successful ice making and cold storage plant, but it may be said that that money will be well spent, inasmuch as it will prove a permanent and lasting investment, and one which must result in a practical economy and a successful operation of their enterprise. Mr. Paddock will at all times be pleased to entertain visitors interested in ice making and cold storage, and to show such about his plant, and give any desired information relative to construction and operation.

The company is now erecting an additional building 25×100 feet in size, two stories high, which will be used exclusively for a poultry department.

We bespeak for the Toledo Cold Storage Co. a successful and prosperous career, well merited by the intelligence and judgment they are exercising in the construction of their model plant.

COLD STORAGE CO. RECEPTION.

THE Quincy Market Cold Storage Co., of Boston, Mass., held a reception on the 24th ult. to inaugurate the opening of their new branch cold storage warehouse at Nos. 35 to 43 Eastern avenue, Boston, which was recently completed, and has a storage capacity of 2,000,000 cubic feet. This gives the company control of 5,500,000 cubic feet of cooled storage space, with a total refrigerating capacity equal to the melting of 1,000 tons of ice per day. An elaborate luncheon was served to the guests, who were also afforded an opportunity to inspect this splendid modern cold storage plant.

USE FOR LIQUID AIR.

DR. CARL LINDE, the eminent German scientist, in a paper presented before the German Society of Naturalists and Physicians, and published in the *Zeitschrift des Vereines Deutscher Ingenieure*, calls attention to a possible use for liquid air in connection with petroleum in internal combustion motors. In this case the charge of liquid air is mixed with the proper proportion of petroleum, and the power developed by the complete combustion utilized in a cylinder. A powerful motor of small weight may thus be constructed, possibly well adapted for motor vehicles. Liquid air, the doctor claims, may prove of limited commercial value in the production of air containing a large percentage of oxygen. The first evaporation at atmospheric pressure, from a vessel containing liquid air, consists of 92 per cent nitrogen and 8 per cent oxygen. By using the cold produced by the evaporation of the first portion to assist in further liquefaction, it is possible to produce air containing 50 per cent of oxygen.

THE forty-first meeting of the American Society of Mechanical Engineers is to be held at Cincinnati, Ohio, May 15 to 18, 1900, at the Grand hotel. Among the papers to be presented are the following: "On the Value of a Horse Power," by Geo. I. Rockwood; "Hot Water Heating from a Central Station," by H. T. Yaryan; "Systems of Efficiency of Electric Transmission in Factories," by W. S. Aldrich; "Multiple Cylinder Engines," by R. H. Thurston; "Water Softening Plant of the Lorain Steel Co.," by N. O. Goldsmith; "The Automobile Wagon for Heavy Duty," by A. Herschmann; "Test of a Fifteen Million Gallon Pumping Engine," by M. E. Cooley; "Cylinder Proportions for Compound and Triple Expansion Engines," by B. C. Ball, etc. The committee has accepted the invitation of the Triumph Ice Machine Co., of Cincinnati, to entertain members and guests at the plant of the Cincinnati Oyster and Fish Co., which was illustrated and described in ICE AND REFRIGERATION for January, 1899.

THE long contested case of the Hygeia Distilled Water Co., of New York, against the Hygeia Ice Co., of New Haven, Conn., has been decided in the Supreme court at New Haven in favor of the Hygeia Ice Co., with costs against the New York Co. The case has been tried twice, the decision once being against the New Haven Co. The case is now remanded for judgment and presumably ended. The effect of the decision is that the Hygeia Co. is entitled to the use of the word Hygeia in its name, but is estopped from using the word to designate any special product, such as "Hygeia Ginger Ale," "Hygeia Distilled Water," etc., distinctive names which the company claims it has never used.

THE first annual business meeting of the British Cold Storage and Ice Association was held in London, England, on March 28. It was announced that B. Godfrey, Sir A. Seale Haslam, T. B. Lightfoot and L. Sterne had become vice-presidents. Provisional arrangements were made for the annual meeting of the Association, to be held in London, May 4, 5 and 6, 1900.

[*Written for* ICE AND REFRIGERATION.]

STEAM CONDENSERS.

SOME FAULTS OF CONDENSERS—CAUSE OF RED CORE IN ICE—ALUMINUM COOLING PIPE—DRAINING TO AVOID EXPANSION STRAINS—FITTINGS AND THREADS—ILLUSTRATION.

BY CHAS. C. EDGAR.

THE form of steam condenser used in the manufacture of distilled water ice determines the quality of the ice and the efficiency of the distilling apparatus to a far greater degree than is generally supposed, and as there are so many poorly designed condensers in general use, the writer thinks a few suggestions in this line would not be out of place.

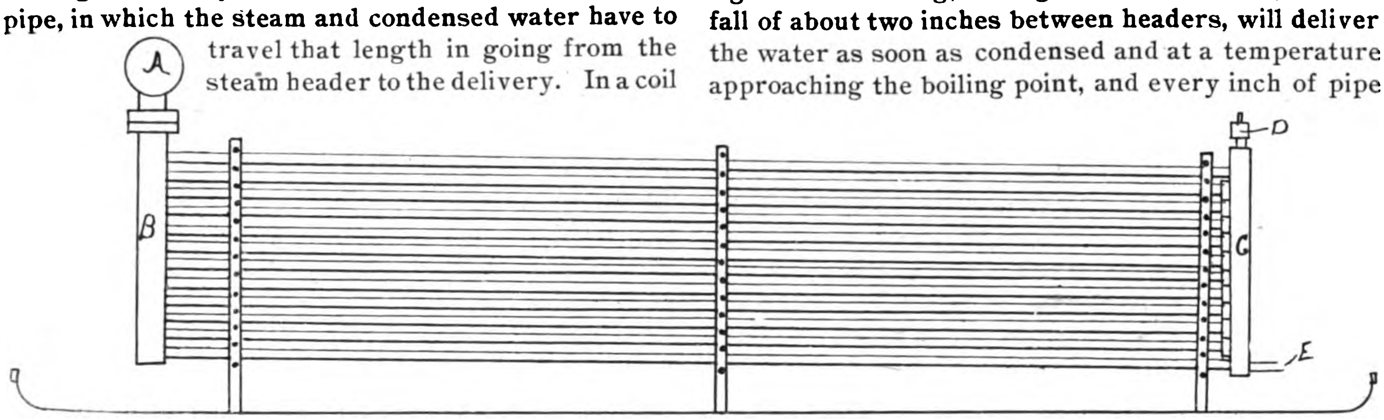
The old adage, "The best is none too good," applies to condensers as pertinently as to anything else about an ice plant. That a condenser is a condenser and will deliver so many tons of distilled water in a given time is not sufficient. It should be so constructed as to deliver the distilled water to the reboiler or skimmer as soon as it is condensed. It should also deliver the water at a temperature approaching the boiling point, or about 210° F., and these two objects cannot be obtained with coils containing from fifty to 100 feet of 1½-inch or 1¼-inch pipe, in which the steam and condensed water have to travel that length in going from the steam header to the delivery. In a coil of this kind—and I dare say the majority in use to-day are of this kind—enough steam at an exhaust pressure of one or two pounds cannot be forced into it to fill it if the coil is properly covered with water, the steam being all condensed long before it reaches the end, and the condensed water, in passing through the rest of the coil will be cooled far below the boiling point. Part of the coil will then be useless for condensing purposes, and the water, reaching the reboiler much lower than the boiling point, will require more steam to reboil it; the result will be a loss of efficiency in both the condenser and reboiler.

But this is not all. While boiling water, free from impurities, has almost no effect on iron, distilled water, at a temperature much below boiling, attacks iron much more rapidly than either cold or boiling water does, and produces not an oxide, but a solution of iron; and this solution, coming in contact with the air in the freezing can and elsewhere, oxidizes and produces a red core. Now, I do not wish to be understood as saying that this is the only cause of a red core, but it is one of them, and all the filters in Christendom will not remove this solution of iron on its way to the freezing can; so the proper way to dispose of it is not to allow any conditions to exist that will tend to produce a solution of iron. We will have overcome one of the most important of them when we keep our condensed water at a temperature as near boiling as possible until it reaches the cooling coils, and these should be constructed of the best galvanized piping, and new piping added as soon as these begin to pit or corrode on the inside.

It is to be hoped that the pipe manufacturers will soon be able to furnish aluminum pipe or some kind that lukewarm distilled water will not attack or dissolve, as the cooling coils play as important a part in the manufacture of good ice as the condenser.

The condenser should be so constructed that it will drain well, and a coil containing fittings such as couplings and returns is not sufficiently drained if set so that the pipes composing it are set on a level or given a slight fall, as the fittings form pockets that hold water which eats the ends of the pipe; and it is no uncommon sight to see the end of a pipe that has been in service for some time eaten to the thinness of a piece of paper.

Coils constructed like those shown in the accompanying sketch, with the usual lengths of pipe, say eighteen feet long, having vertical headers, with a fall of about two inches between headers, will deliver the water as soon as condensed and at a temperature approaching the boiling point, and every inch of pipe will be available for condensing, admitting of a high degree of efficiency in both the condenser and reboiler, and eliminating, as far as possible, the dissolving influence of distilled water.



IMPROVED FORM OF CONDENSER COIL.

A—Steam Manifold. B—Steam Header. C—Water Header. D—Air Valve. E—Condensed Water Delivery.

To avoid expansion strains the ends of the pipes could be screwed into header *B* and all but top and bottom pipes joined to header *C* with a packing gland. The top and bottom pipes could be threaded right and left, or a union used to connect them.

This construction admits of a minimum of fittings and threads and of leaks and repairs, which is no small item in the operation of an ice plant where the water used for cooling purposes contains scale forming ingredients. A coil of this kind containing twelve 1½-inch pipes eighteen feet long would condense five tons of steam in twenty-four hours, with water for cooling at 100° F., when covered with the usual amount of scale.

Twelve pipes high would be a convenient height, but it could be built much higher and the same degree of efficiency maintained. The higher the coil the fewer coils would be necessary for a given plant, and also the fewer cooling water distributers necessary, as these are generally a source of trouble.

[*Reprint from Advanced Sheets of* UNITED STATES CONSULAR REPORTS.]

INCREASING THE EFFICIENCY OF STEAM ENGINES.

RESULT OF EXPERIMENTS IN THE MECHANICAL LABORATORY OF ROYAL TECHNICAL HIGH SCHOOL, CHARLOTTENBURG, GERMANY—DISCOVERY—ILLUSTRATION.

THE recent centennial anniversary of the Royal Technical high school at Charlottenburg was made the occasion of several important announcements concerning the work of that renowned institution, which embodies in a remarkable degree the advanced technical science which has done so much to push Germany forward into the front rank of manufacturing nations. Among these, the first rank is by common consent accorded to the paper of Prof. E. Josse, head of the mechanical laboratory, in which are described with elaborate detail the results of his experiments with an original and highly interesting process for increasing the efficiency of steam engines by utilizing the heat of the exhaust steam for evaporating another liquid having a lower boiling point than water.

It is well known that the steam boiler and engine, notwithstanding all improvements which it has undergone during the past 100 years, and its incalculable services to mankind, is nevertheless a wasteful and extravagant device for converting the energy stored in fuel into mechanical power. The ordinary simple high pressure engine, which, after passing steam through one cylinder, discharges it into the air, utilizes hardly more than 5 per cent of the value of the fuel consumed under its boiler. The compound engine, in which the steam, after passing successively through two, three or more cylinders, is condensed, and the warm water of condensation restored to the boiler, utilizes under favorable conditions 12 to 13 per cent of the fuel energy, and there the economy appears to have stopped. An eminent American engineer has recently published an article reviewing the development of the steam engine, and closes his essay with the expressed opinion that with the compound machines and improved cut-off of recent years the practical limit of efficiency of the steam engine has been reached. The invention described by Professor Josse introduces a novel element into the problem, and opens a new chapter in the record of steam engine development.

The process is the joint discovery of Mr. G. Behrend, a Hamburg engineer, and Dr. Zimmermann, of Ludwigshafen; and, although first patented in 1889, it has only recently been matured and its application perfected by the employment of an auxiliary engine, which, utilizing the heat contained in the exhaust steam, gains as high as 56 per cent additional motive power without increasing the expenditure of fuel. The principle and process involved are simple, and may be briefly described, as follows:

It is plain that, with all progress which has hitherto been made in steam engine practice through higher pressures, superheated steam, economical cut-offs, or successive cylinders, there is always an important and inevitable loss of heat energy when the steam, having done its work, is discharged into the open air or changed back to water by contact with cold water in a condenser. When the exhaust is into the open air, the steam has a temperature of about 100° Celsius (212° F.); when it passes into a condenser, the steam has a temperature of 60° to 70° Celsius (140° to 160° F.), according to the vacuum. The corresponding latent heat of steam, given up upon change of form from steam to hot water, has hitherto run to waste in the condensing or cooling water, or in the air. Messrs. Behrend and Zimmermann attacked the problem of utilising this wasted caloric by employing it to create a new supply of steam by evaporating some liquid which has a lower boiling point than water, and for this purpose they chose, after many experiments, sulphurous acid (SO_2), which is not only cheap and easily obtained, but has the further advantage of a viscous consistency, and lubricates the inner working surfaces of the machinery without corroding them. Their demonstrations, although not practically conclusive, were so promising that Professor Josse, as a technical authority on this subject, took up the problem, and, after several months of highly satisfactory laboratory experiment, caused to be constructed and connected with an ordinary working steam engine of the compound type an additional condenser and auxiliary engine, the power of which could

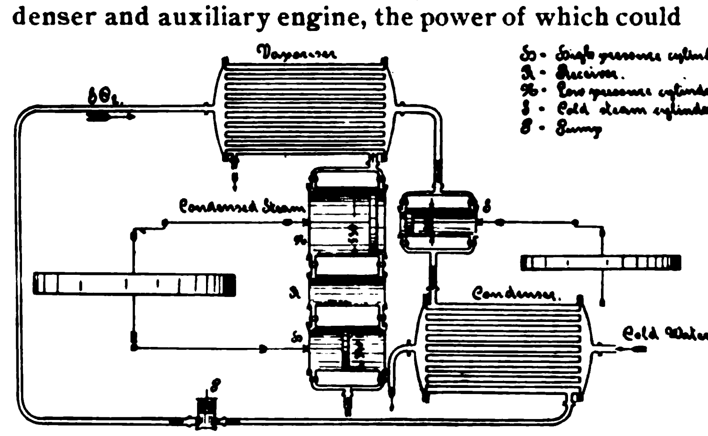


DIAGRAM SHOWING RELATION OF WORKING PARTS.

be exactly measured. The whole working apparatus is shown in the engraving herewith submitted, and the technical details will be explained by the drawing, and may be thus described:

Referring to the diagram, in which dimensions are given in millimeters, *H* and *N* represent the high and low pressure cylinders of an ordinary compound steam engine, with a stroke of 500 millimeters (19.69 inches) and a speed of 41.5 revolutions per minute. From the low pressure cylinder *N* the exhaust steam passes into the surface condenser, called in the diagram the "vaporizer." In this vaporizer, or condenser, the cooling medium used, instead of water, is liquid sulphurous acid (SO_2), which has a boiling point so low that it is immediately decomposed by the heat of the exhaust steam, whereby the sulphur dioxide gas (SO_2) is liberated, which passes over into the cylinder of the auxiliary engine *S*, where its work is done, as in an ordinary steam engine. The auxiliary cylinder has a diameter of 300 millimeters (11.81 inches) and a stroke of 500 millimeters, with a speed of 77 revolutions per minute.

After passing through this cylinder, the sulphurous vapor enters the surface condenser, around the tubes of which cold water flows, as in an ordinary steam plant. Here the sulphurous vapor is condensed

to liquid and is forced by the pump P back into the vaporizer, where it begins its cycle again the same SO_2 being used over and over again indefinitely. There are therefore, in fact, two condensers, the first serving, as it were, as a boiler or steam generator for the auxiliary engine; and this boiler, instead of being fired by coal, obtains all its heat from the exhaust of an ordinary steam engine, and, instead of converting water into steam, evaporates a liquid which is much more volatile—*i. e.*, has a far lower boiling point.

The steam engine is of the compound type, of good, modern construction, and being given a steady load, developed thirty-four indicated horse power, with a consumption of 8.6 kilograms (18.96 pounds) of steam per indicated horse power hour. The auxiliary machine working with the sulphurous vapor indicated nineteen horse power—that is, an increase of 56 per cent and yielding, instead of one horse power, 1.56 horse power for the same steam consumption and reducing the steam consumption from 8.6 kilograms to 5.5 kilograms (from 18.96 to 12.13 pounds) per indicated horse power.

The experiments showed on the average that for every fifteen kilograms (33.169 pounds) of steam passing through the main engine one horse power could be gained in the auxiliary machine. Applied, therefore, to an ordinary single-cylinder steam engine, exhausting into the air at high temperature, the percentage of power saved by this new device would be very much higher than the economy reached in these experiments, which, as has been shown, were made with a highly improved compound engine. From the average of these experiments it may be broadly stated that, given a fairly economical compound engine, using seven and one-half kilograms (16.5 pounds) of steam per indicated horse power hour, half an indicated horse power could be produced in the auxiliary machine for every indicated horse power developed in the main engine. Assuming an average vacuum of sixty centimeters (23.62 inches), corresponding to a temperature of 60° Celsius (140° F.), the saving of heat must be accomplished by using a liquid which can be vaporized to a high pressure at or below that temperature. Assuming, further, the upper and lower limits of temperature within which the operation is confined to be 60° and 20° Celsius (140° and 67° F.), the pressure of the sulphurous vapor would range from 10.05 down to 2.35 atmospheres above open air pressure. A working pressure as high as ordinary steam boiler pressure is therefore readily obtained at a comparatively moderate temperature. Moreover, the volume of sulphurous acid vapor necessary to contain the number of heat units corresponding to the work to be performed is much smaller than the volume of steam which would be required for the same purpose. As the saving to be effected by the auxiliary engine depends directly upon the difference between the highest and lowest temperatures involved, the greatest gain will therefore be made either when the water in the surface condenser is as cold as possible or when the heat of the exhaust steam from the engine is at a maximum, as is the case with a single-cylinder steam engine without condenser, which may be anywhere up to 212° F.

The expense of this improvement is practically all in the construction cost of the vaporizer, condenser, and auxiliary engine itself, and its economy may be realized from the fact that the exhaust steam from a 2,000-horse power central station engine should furnish power to drive an additional 1,000-horse power engine, which can be connected as an extra cylinder to the steam engine or run independently, and thus increase by 50 per cent the power developed without adding a pound to the quantity of fuel consumed. When, in view of the present coal famine throughout Europe, it is remembered that the steam engine energy of Germany alone, afloat and ashore, is not less than 3,717,264 horse power, the commercial importance of such an improvement will be apparent.

REGENERATING PRINCIPLE APPLIED TO CO_2 MACHINES.

By Alfred Siebert, C.E.

In order to explain the apparent discrepancy between the scientific fact that CO_2 will not liquefy with cooling water over 88°, and the statement of the manufacturers of such machines, that the machine does work, even with water at 90°, we must try to apply the regenerating principle. Professor Linde found the formula for air, giving the reduction in temperature obtained by reducing the pressure, but as far as I know, the same has not yet been determined for CO_2. But the co-efficient of dilatation of the two gases is very nearly alike, and therefore, in the absence of correct data, we can very well use the value found for air.

The formula reads as follows:

$$D = 0.476\,(A - A^1)\left(\frac{493}{T_0}\right)^2$$

Wherein D = reduction in temperature F.

T_0 = initial absolute temperature, F.

A and A_1 = pressures expressed in atmospheres.

Assuming now that the pressures are 1,200 and 342 pounds, respectively, and that the water is 90°, then it will be impossible to liquefy; but if there should be an arrangement by which it is intended to cool the liquid by the return gas, this would come very handy for regeneration. The compressed gas at 1,200 pounds pressure, having been cooled to 90° by the water on the condenser, is now cooled to the temperature of the return gas = 12°, then it passes the expansion cock and is reduced to 342 pounds pressure; but according to our formula this would cool the gas $D = 0.476\,(82-23)\left(\frac{493}{472}\right)^2 = 28°$, or we would get if we exchanged heat with the brine at 12° $28 \times 0.2167 = 6$ thermal units, 0.2167 being the specific heat of CO_2.

If the machine is working with 968 and 342 pounds, respectively, which corresponds to a water temperature of 77°, then we would have obtained $121.5 - (57.06 + 20.92) = 43.52$ thermal units; but this is, of course, producing liquid. While, therefore, the machine does little work when not condensing, it still does work which could not be explained otherwise than by regeneration.

The only other way to obtain such results would be by providing a liquid expansion cylinder, which, in case the condensation should stop, produces very low temperatures, like a compressed air machine; but even such a machine cannot compare with the machine handling a liquefiable gas.

Written for Ice and Refrigeration

CHLORIDE OF CALCIUM BRINE.*

COMMON SALT VS. CALCIUM CHLORIDE IN BRINE MAKING—FREEZING POINT OF CALCIUM BRINE—HOW TO MAKE THE BRINE—TABLES OF PROPERTIES.

By Madison Cooper

A NON-CONGEALABLE liquid is used in refrigeration as a secondary or circulating medium for absorbing the cooling effect of an expanding gas, and applying it directly to the work to be done. This non-congealable liquid is usually a solution of common salt in water; but of late chloride of calcium has come into use quite extensively for this purpose. Probably the chief reason why it has not come into general use to the exclusion of common salt brine, is from the fact that it is, or has been, much more expensive in first cost, it is more difficult to prepare and handle the solution, and also that it cannot be obtained everywhere like common salt. Chloride of calcium possesses positive advantages over common salt for brine making. It is now used by many of the leading engineers in the business, and where once adopted, has not, in a single instance known to the writer, been discarded for common salt.

Those who have written on the subject of refrigerating machinery and refrigeration, have had very little to say regarding the merits of the two different salts for brine purposes. Most of the information available relates to common salt brine, which is a sort of tacit recommendation for its use; but brine and brine making in a general way has been given very little attention by writers on refrigeration. In connection with some investigations bearing on the process for preventing frost on refrigerating pipes already described, the writer has collected all the available information on the general subject of chloride of calcium, and all facts obtainable show that calcium brine has important advantages over that made from common salt.

The manufacturers or venders of chloride of calcium claim that it is a better conveyor of refrigeration and that "it does not eat up the pipes like salt." These claims are, roughly speaking, true, and if the reasons why had been given, the claims would have more weight with engineers. The writer's reason why chloride of calcium brine will not rust refrigerating pipes has already been given in connection with the explanation why calcium brine trickling over the pipes in the frost preventing process, will not rust the pipes. Probably ordinary salt brine will not corrode the pipes very much more on the inside, but wherever it has access to the exterior of the pipes in contact with air, as from a leaky joint, the corrosion and deterioration is much more rapid than where calcium brine is used. The surfaces of pipes moistened by common salt brine, are, owing to varying conditions, causing a tendency to dry at one season of the year, and become moist at another, subject to the action so favorable for the corrosion of the metal. Calcium brine will not, under any conditions to be met with in cold storage rooms, give up enough water to lose its liquid form, so will not allow of a drying out on the pipes under any circumstances. Calcium brine is a better conveyor of refrigeration than salt brine, because with a given freezing point at a given temperature, its specific heat is higher, consequently less brine is necessary, and less is required to be circulated than would be if common salt brine were used.

Obviously calcium brine has a great advantage over common salt brine at temperatures below zero F. Common salt brine at its maximum density will freeze at about 7° below zero F., while calcium brine can be made which will not freeze at 50° below zero F. It will be seen that where a temperature of zero F. or lower is required in cold storage rooms with brine circulation, calcium brine only can be used. For a given minimum brine temperature a less dense brine of calcium can be used than of common salt, giving more conducting power per pound. The advantages of this are that a given weight of calcium brine can be made to convey more units of refrigeration than the same weight of salt brine, saving in the weight and amount of brine to be circulated. Chloride of calcium brine has the advantage of not being liable to deposit crystals in the pipes should the temperature drop below normal, and there is practically no danger of freezing if reasonable care is used in its preparation. Reference to the subjoined table shows that calcium brine has an ultimate freezing point of about 54° below zero F. with a 30 per cent solution. A 25 per cent solution is all that is required in almost any work, and for most purposes a 20 per cent solution is amply dense. For ice making, where a brine temperature of 10° to 20° F. is carried in the tank, a brine ranging from 12 to 18 per cent is all that is required. The brine must, of course, be strong enough to prevent ice forming on the expansion coils, so that the temperature of the expanding ammonia must largely regulate the density of the brine. It will be noted from the table that a very strong solution of chloride of calcium has a much higher freezing point than a more dilute brine. A brine containing too much calcium is therefore to be guarded against. The most common test for brine is the salometer, a hydrometer scaled from zero or pure water to 100 per cent or more, which is about the point of a saturated solution of common salt brine. A Baumé hydrometer scale can also be used for ascertaining percentage of calcium. The per cent of calcium given in the table represents the total per cent, and as the commercial fused chloride of calcium already contains about 25 per cent of water, more of this article will be required for a given quantity of water than is stated in the table. The small sub-table of approximate practical proportions of the commercial calcium and water, for brine of a required test, will be found useful in the making of brine.

The preparation of brine, using chloride of calcium, is a simple matter, but somewhat slower than where common salt is used, owing to the much smaller surface exposed to the action of the water. It is difficult to break calcium by hand into small grains like salt, therefore it dissolves comparatively slowly. The simplest way is to put the correct proportion of calcium and water in a barrel or barrels, and stir slowly with a piece of gas pipe to facilitate solution. Another method is to put the correct quantity of calcium and water in the brine tank, and start the pumps running. The circulation of water in con-

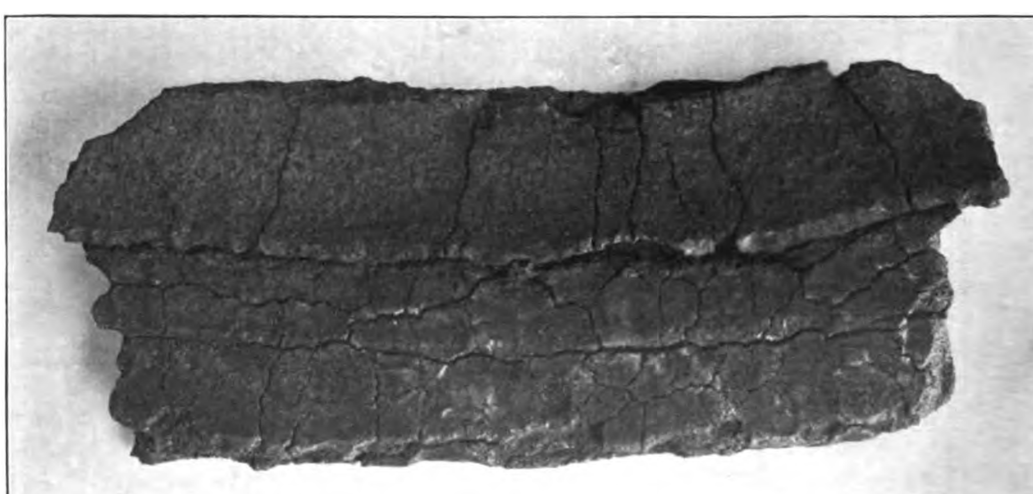
CORROSION OF RECTIFIER PLATES.

THE accompanying photo-engravings, made of two pieces of iron taken from worn out rectifier plates of an absorption machine, give a very good illustration of the corroding action of the elements in these appliances under certain circumstances and conditions. The whys and wherefores have not as yet been fully explained by our learned experts.

In order to throw, if possible, some additional light on this subject, we have submitted these pieces of iron, which are the subject of the accompanying cuts, to Dr. Frerichs, of the Herf & Frerichs Chemical Co., of St. Louis, for examination and opinion, and the following is the report which he has kindly volunteered on the composition of these scales or products of corrosion, viz.:

PIECE OF IRON FROM WORN OUT RECTIFIER PLATE OF ABSORPTION MACHINE.

The sample of iron scale which you have sent me some time ago has been analyzed. It contained small quantities of chloride, and very little alumina and calcium compounds; and besides 10.7 per cent of an insoluble, but combustible substance, consisting principally of carbon and carbon compounds. The amount of iron contained in the crust is 79 per cent. From this it would seem that the iron was very impure cast iron, and the presence of chlorine, alumina and calcium would indicate that some brine might have found its way into the ammonia and caused the corrosion.



IRON FROM RECTIFIER PLATES OF ABSORPTION MACHINE, SHOWING CORROSIVE EFFECTS.

Do any of the readers of ICE AND REFRIGERATION know of a remedy or have any experimented successfully in efforts to minimize this corrosive action? If so we shall be pleased to hear from them.

——Armour & Co., Chicago, Ill., on April 20, held a formal opening of their new power plant at the Union Stock Yards, Chicago. All the machinery for power, refrigeration and lighting is now in one great building, having 40,000 square feet of floor space. Electrical power, generated in this power house, takes the place of steam power for all the various buildings constituting this extensive packing house and allied industries. This new power plant was erected, it is stated, at a cost of more than $1,000,000.

LIQUID AIR AS AN EXPLOSIVE.

MR. FRANK H. MASON, United States consul general at Berlin, Germany, has reported on some experiments made with liquid air for explosives, which are interesting in many ways in showing the obstacles which are still in the way of the practical utilization of liquid air, even for purposes for which its utility cannot be doubted, theoretically speaking. Mr. Mason says that ever since it was demonstrated that liquid air could be readily produced on a commercial scale, it has been hoped and expected that one of the principal uses to which it would be applied would be that of an explosive material for blasting purposes, particularly in mines, where the new explosive would have the important advantages of safety in handling and of not vitiating the air, like gunpowder or dynamite, by the gases of ignition.

Some months ago a newspaper report announced that liquid air had been formally adopted for blasting purposes in the government coal mines of Germany, but inquiry proved that this announcement was at least premature. The fact appears to be that experiments—more or less successful—have been made, especially by Professor Linde, of the Polytechnic high school at Munich, but no formal adoption of the new explosive by the government bureau of mining industries has yet taken place.

Among the most systematic and interesting practical experiments thus far made in this direction has been the series of tests lately undertaken by the Vienna Crystal Ice Co., in the presence of experts from the Austrian technical committee for the war department. The liquid air used in these tests was obtained from the Linde Co., at Munich, and shipped to Vienna in open flasks, provided with the Dewar vacuum jacket and packed with felt and cotton wrappings

in wooden cases, with a loose cap of felt over the open mouth of each flask. When put up at the laboratory for shipment the liquid contained 75 per cent oxygen to 25 per cent nitrogen; but before it had reached Vienna and was used in the experiments, it had lost about half its bulk by evaporation, and what remained contained 85 per cent oxygen to 15 per cent nitrogen. The absorbents used in preparing the cartridges were silicious marl (Kieselguhr) and "solar oil," and, according to the report, two methods of preparation were employed. By one process the marl and oil were mixed in a wooden vessel, and the liquid air gradually added until a stiff paste was formed, which was packed in paper cartridge shells covered with asbestos.

By the other plan, the mixture of marl and oil was put into the cartridge, which was inclosed in a lead case with a layer of felt between, and the liquid air then poured in until the paste was completely satureted. The cartridges prepared by both methods were safe and readily transportable, and their explosive power was tested by firing at the bottom of deep holes bored in rock. The results showed that while liquid air is an efficient explosive, it is less effective than dynamite, gun cotton, explosive gelatin or giant powder.

The conclusions of the military experts were concisely as follows: Both methods of preparing the cartridges were pronounced wasteful, and in consequence of the rapid evaporation of the liquid air they must be used immediately after being prepared; beyond fifteen minutes the evaporation will so affect the cartridge that it is likely to miss fire, and its strength can not be even roughly guaranteed. On the other hand, the cartridges when freshly prepared are powerful and well adapted to coal and other mining, and, while the large amount of oxygen set free by the firing of successive charges might increase the danger of explosion in the air and gases of the mine itself, the quality of the air for breathing purposes would be definitely improved.

The net conclusion to be derived from these and preceding experiments in Europe is that, notwithstanding the obvious advantages of liquid air as an explosive for mining purposes, the rapid deterioration of the cartridges and their varying and uncertain strength are obstacles so serious that, until they can be overcome, its value and application to that use will remain experimental and comparatively limited.

CAR REFRIGERATION BY LIQUID AIR.

I HAVE read in the daily papers that a shipment of fruit has left California for the east, the cars refrigerated by liquid air contained in bottles. It was further stated that the bottles were used, one a day, and that a great saving was effected by reducing the weight of the refrigerant over that of ice formerly sent.

The renewal can only be done if liquid air factories are established, so that at stations twenty-four hours' travel apart, fresh liquid can be taken in, otherwise a sufficient supply of drums must be sent in the cars to be able to use a new one every twenty-four hours.

Assuming now that the voyage lasts eight days, and that in such cold cars liquid air can be preserved for 100 hours, without using it, which Professor Linde declares to be the practical limit, then there must be taken in a new supply after four days' travel, and while we require only one bottle the first day, we must use one and one-third bottles the next day, as each one contains only three-quarters of its original contents. The next day we require two bottles, as each one contains only one-half its original contents, and the fourth day we must use four bottles, since each contains only one-fourth of its original contents. We need, therefore, seven and one-third, or, for safety, eight bottles, for four days.

Expressing the equivalent cooling capacity of these eight bottles in pounds of ice, which would have been otherwise carried, we find, latent heat at atmospheric pressure and at $-312^\circ = 140$ Th. U.; sensitive heat, heating the air from -312° to $32^\circ = 82$ Th. U., or a total of 222 Th. U. per pound of liquid, or, expressed in pounds of ice melted, $= 1\frac{1}{2}$ pound.

If one bottle, therefore, contains 100 pounds of liquid air, and we assume the weight of the bottle to be also 100 pounds (ammonia drums containing 100 pounds of anhydrous ammonia weigh 200 pounds, or a total of 300 pounds), then we have, to do the work for four days, which would require $400 \times 1.5 = 600$ pounds of ice, to carry a weight of $8 \times 200 =$ 1,600 pounds of liquid air in bottles.

Of course the ice which is not used the first day will melt somewhat, but this can be very little, because it is at the same temperature, or almost so, as the surrounding air, while the liquid is at a temperature of -312°. The losses by radiation to the car walls are in both cases the same, so we do not need to take account of them.

Should, later on, stations for manufacturing liquid air be established, so that fresh liquid air can be obtained every twenty-four hours, even then the weight is in favor of the ice, for to do the work of 150 pounds of ice we must carry a bottle containing 100 pounds of liquid air, weighing 200 pounds.

Of course there will be one great advantage, and that is, that the temperatures can be kept as low as desired, and the air in the cars will be dry, and perhaps since the air evaporated will push out part of the air in the car which may have become foul the ventilation might benefit the fruit. Whether, however, this advantage, including the additional freight bill (also return of empties) will be sufficient to make up for the difference in price is a matter to be considered by the shipper.

The lowest price I have ever heard mentioned is one-third of a cent per pound (I assert it cannot be made for refrigerating purposes for much less than one and one-half cents per pound), while ice can be had at all times in large quantities at one-eighth of a cent per pound. ALFRED SIEBERT.

THE provincial government of New Brunswick has passed a bill in aid of cold storage enterprises. It provides that the government may guarantee 4 per cent interest for forty years on the first mortgage bonds of any company erecting a cold storage warehouse in either of the four principal towns of the province, $60,000 being the limit in amount, the total in no case to exceed 75 per cent of the total cash value of the plant. The bill was brought in the interest of a proposed cold storage plant at St. John.

[Read before the Engineers' Club, St. Louis, April 4, 1900.]

COMMERCIAL VALUE OF LIQUID AIR.

REASONS FOR ITS INAPPLICABILITY FOR REFRIGERATION AND POWER—FIGURES REGARDING COST AND REFRIGERATING CAPACITY—FOR POWER PURPOSES—METHOD OF SHIPPING.

By Alfred Siebert.

ALL the experiments usually made with liquid air are very interesting and will lead, no doubt, to its use in surgery, science and, perhaps, war purposes, but commercially, for power and refrigeration, it is not available, for the following reasons: The machines required to produce it are too complicated and therefore too expensive, if used for refrigeration.

While the liquid itself can be produced cheaply enough, its use for refrigeration and power is entirely too expensive, and could only be permissible where temperatures are needed which can be obtained by no other liquid than air, or for experimental, scientific and war purposes.

Liquid air cannot be shipped or conveyed through pipes without great loss and without danger.

Complicated machinery is required, because we have to deal with such high pressures, 2,500 to 2,900 pounds, and must compress in several stages; further, while we cool with water the compressed gas after each compression, we must do the final cooling by the air itself. This requires expensive apparatus.

Professor Linde was the first to discover that the law which states that a permanent gas, if expanding without performing work, will abstract no heat, does not hold good for air. In fact, he found that this reduction was about ½ degree F. per atmosphere pressure lowered, and that this value increased the more the initial temperature came to the absolute zero.

Professor Linde gives the following formula: $D = 0.476\ (A - A^1)\left(\frac{493}{T_0}\right)^2$ wherein D = reduction in degrees F.

A and A^1 = atmospheric pressure, in atmospheres.

T_0 = absolute initial temperature.

493 = the absolute temperature in degrees F. at freezing point.

There are really only two types of such machines for producing liquid air, the Linde and the Tripler machine; the others are mere deviations from same.

Professor Linde uses two compressors and a regenerator, with three distinct coils, one in the center of the other, and Tripler uses three compressors and one regenerator, with two distinct coils in the center of one another. Professor Linde uses the heat abstracted by circulated air for the first cooling, exclusive of water cooling, and does the final cooling by air expanding in the atmosphere; hence he needs three coils. Tripler uses only air expanded in the atmosphere to do his final cooling; hence the two coils. Professor Linde, to get one pound of liquid, adds six pounds, circulates twenty-one and wastes five pounds of air. Tripler wastes 78 per cent of the air handled, and gets finally 22 per cent of liquid air, but must waste 93 per cent of the air when producing liquid at atmospheric pressure.

Professor Linde, in his small machine, which requires three horse power, produces 1.8 pounds of liquid air per hour, or requires 1.7 horse power per pound of liquid produced. Tripler, with a machine which uses sixty-five horse power, working with only one compressor, compressing from 500 to 2,500, produces 180 pounds of liquid air per hour, or requires about one-third horse power per pound, while, when the expanded air is used in first compressor, the horse power = 200, and the horse power required per pound of liquid = 1.45 horse power; that is, when producing liquid air at atmospheric pressure, he uses 3.6 times as much power as above.

Estimating that one horse power will cost one cent, including interest on capital, deterioration of machinery and building, besides coal and labor, we find that Professor Linde produces one pound for one and three-fourths cents, and Tripler produces one pound for a little more than one-third cent, and if produced at atmospheric pressure, as Linde does, at the same price, viz., one and three-fourths cents. This, of course, is cheap enough, as far as the material obtained goes.

If we now consider the application of this liquid air for refrigeration, we are first confronted with the absence of values for specific heat and latent heat, and know only that the latent heat is 140 thermal units at atmospheric pressure, as determined by Professor Jacobus, and that the temperature is at this pressure —312° F., while the critical temperature is —220° F., and the critical pressure 573 pounds.

Since it is so very difficult to get a temperature much below the critical temperature, I have in my calculations of the process, which will appear in Ice and Refrigeration, assumed that the liquid is produced at —215° F., and further assumed that the latent heat was then 140 thermal units, which, of course, is impossible, but which I have done to give the air the benefit of the doubt, in every instance. The latent heat at — 312° must be 0, therefore it cannot be very great near this point, and surely not 140.

We know, however, the latent heat at atmospheric pressure, and can therefore calculate the refrigerating effect for the liquid air at this pressure [(—215)+(+32)] × 0.238 = 59 thermal units, is the heat obtained by the heating of the evaporated air from —215° to 32°, which latter temperature we must assume as being required to obtain and to maintain, or if liquid is evaporated at atmospheric pressure temperature = 312 + 32 × .238 = 82 thermal units. This added to the latent heat gives 140 + 82 = 222 thermal units. Expressing this in pounds of ice melted, 222 ÷ 142 = 1.5 pounds.

It has cost 1.45 cents to produce one pound of liquid, therefore the one pound of ice would cost one cent, or the ton of ice melted (that is, the capacity in refrigeration) would cost $20, and to make one ton of ice, actually, would cost $40.

Any good ammonia machine using cooling water of 56°, which I had assumed as used in the air machine, would produce one ton of refrigeration with 1¼ horse power per day, or at an expense of 24 × 1.25 cents = 30 cents, or make the ton of ice actually for sixty cents, or sixty-six times cheaper than an air machine.

If we now consider the application of liquid air for power:

Assuming that we admit one pound of liquid air into a cylinder, and by heating the liquid with water at ordinary temperature evaporate the liquid at 400 pounds pressure (573 pounds being the critical pressure, I thought that this pressure would be as high as permissible), the piston then has traveled a certain distance, and the air behind is still under 400 pounds pressure. Now, we remove the water, and allow the air to expand behind the piston down to fifteen pounds.

Then it is evident that the work done by the evaporation is the external latent heat of the liquid air, while the internal latent heat has been used to change the liquid into a gas.

Prof. Linde gives the density of liquid air as = 0.9333, and we know that one cubic foot of air weighs at 32° = 0.08 pounds. Therefore the final volume obtained must be 0.9333 ÷ 0.08 = 11.8 cubic feet at 32°. But the temperature of the liquid, and consequently that of the evaporated gas, was assumed to be —215°, therefore the volume will be decreased in proportion to the absolute temperatures, and its pressure = 400 pounds, therefore the volume after evaporation $= \frac{11.8 \times 15 \times 235}{400 \times 492} = 0.2113$ cb. ft.

The external latent heat, therefore, at 400 pounds pressure $= \frac{0.2113 \times 400 \times 144}{772} = 15.76$ th. u.

and the final temperature, $T_0 = T^1 \left(\frac{P_0}{P^1}\right)^{0.29} = 57^\circ$ abs.,

and the final volume $V_0 = V^1 \left(\frac{P^1}{P_0}\right)^{0.71} = 2.17$ cb. ft.

The effective mean pressure—

$$p_m = \frac{n}{n-1} P_0 \left[\left(\frac{P^1}{P_0}\right)^{\frac{n-1}{n}} - 1\right] = 81 \text{ pounds.}$$

And finally the horse power equals—

$$\frac{144 \times 2.17 \times 81 \times 100}{33000} = 76.7 \text{ horse power.}$$

We required for this work 1 × 100 × 60 = 6,000 pounds of liquid air, or we receive per pound of liquid $= \frac{1}{80}$ horse power; or figuring again the cost of one pound = 1 cent = 80 cents per hour.

The work required to make one pound of liquid air, which requires the handling of 2.3 pounds of air in Tripler's machine, is calculated (in an article in Ice and Refrigeration) at 100 strokes per minute, in machine producing liquid for power.

Such use of liquid air is of course only possible, first, in a liquid air factory, where the liquid can be kept under pressure in the receiver; or, second, when the vessel used for shipping is provided with a pressure regulating valve, keeping the liquid under 500 pounds pressure, allowing part of the liquid to expand into an outer vessel provided for keeping the temperature down to —215° by evaporation, and after this, reduction in pressure, followed by reduction in temperature. Such valve will at the same time regulate the amount of liquid used for self-cooling, which is necessary to avoid an explosion, and should this valve refuse to work at any time, a fearful explosion must follow, as the liquid cannot exist at a temperature above —220.

There is, however, another way to utilize the liquid, even when shipped, while under atmospheric pressure, and which is by far the more economical, as will appear later.

The cylinder, with piston as before, is attached to a small vessel and communicates with it through a comparatively small and short opening, which must be controlled by a forced motion, which, however, can also be controlled by a governor. At the beginning of the working stroke the valve is closed. Connection is made to the small vessel by a valve with forced motion, and this connection has been open during all the time the valve leading to the cylinder is closed, that is, during expansion and exhaust. This is necessary to give the liquid time to be evaporated and to be heated by ordinary water, say to 80° F. This liquid inlet is also controlled by the governor, so as to regulate the amount of liquid used per stroke.

The vessel containing a store of liquid must be placed higher than the evaporating vessel, so that the liquid can flow to the latter by gravity, as both are under the same pressure, fifteen pounds. When the proper amount of liquid has been admitted, for which one-quarter of the stroke will be sufficient time, then the inlet valve is closed and water automatically poured over the evaporating vessel, which will first evaporate the liquid and heat the air to 80°. But since this vessel is small, the pressure must rise at the same time, and the capacity of the vessel can be made so that 1,000 pounds pressure is obtained. This is possible to an almost unlimited extent; its only limit is reached when the size of the vessel is equal to the volume of the liquid admitted, but of course this would not only be dangerous, but would give pressures nobody would care to work with.

Assuming now that we put one pound of liquid air per stroke in this evaporator, and proceed as above detailed, we must first find the displacement of the cylinder required. We found before that one pound of liquid air would furnish 11.8 cubic feet of air at atmospheric pressure and 32°, but we have evaporated the liquid at —312°, and have therefore a volume of 148 : 490 :: x : 11.8; x = 3.56 cubic feet. We raised then the temperature from — 312° to 80°, and therefore would have increased the volume again 148 : 540 :: 3.56 : x; x = 12.9 cubic feet.

After this we have increased the pressure from fifteen to 1,000 pounds, which, of course, is only an imaginary process, as both changes must take place simultaneously. This makes the volume 0.18 cubic foot, while one pound of liquid occupies only 0.017 cubic foot. Therefore the cubical contents of the evaporating vessel must be 0.18 cubic foot. We then discharge the air into the cylinder, driving the piston forward with 1,000 pounds pressure only at the start, and expand at once, deriving no benefit from the air in the evaporator directly, only the expansion of it, and we must consider this as the clearance. The final volume then, $V_1 = V_0 \left(\frac{P_0}{P_1}\right)^{0.71} = 3.55$ cubic feet, and adding the clearance, 0.18 cubic foot, the final volume is 3.73 cubic feet.

The mean pressure for this—

$$p_m = \frac{n-1}{n} P_0 \left[\left(\frac{P^1}{P_0}\right)^{\frac{n-1}{n}} - 1\right] = 123 \text{ pounds,}$$

and the horse power for 100 strokes per minute is $\frac{100}{33000} \times (144 \times 123 \times 3.73) — (144 \times 0.18 \times 1{,}000) = 122$ horse power.

We had to use for this work 1 × 100 × 60 = 6,000 pounds of liquid air, and therefore the amount of horse power obtained per pound of liquid $= \frac{1}{50}$, or about

60 per cent more than in the other process tried. This difference is due to the higher pressure which we could employ, in the first place, and to the greater amount of heat transformed into work, in the second place. We reduce the temperature from 235° to 57° = 183°, and in the second case from 540° to 156° = 484°. Final temperature in second case—

$$T_0 = T_1\left(\frac{V_1}{V_0}\right)^{n-1} = 540\left(\frac{0.18}{3.73}\right)^{0.41} = 156°.$$

The liquid has first been shipped in double glass vessels, the air having been exhausted from the annular space, to form a good non-conductor, then the whole well insulated, a cotton stopper put in the mouth of the bottle, so as to act as safety valve, and the liquid keeps itself cool by the heat abstracted, when part of it evaporates and escapes into the atmosphere; and such vessels have been known to last fourteen days, when no liquid was abstracted.

Commercially it is not possible to use glass vessels, and wrought iron vessels have been employed, similarly constructed and insulated; but I consider it better (and it has most likely been done already) to allow the escaping gas to pass into the outer vessel first and to cool the inner vessel, as it will contain some liquid mechanically carried along, which would otherwise do no good. Such vessels lose 4 per cent per hour of their charge, so that it will require a supply of 154 pounds to utilize 100 pounds per ten hours. Fifty-four pounds have been used to preserve the remainder.

Professor Linde thinks that we may reduce this waste eventually to 1 per cent per hour, but that this will be the limit. This explains the remark made by some of the men who have given lectures and made experiments with liquid air, that the express companies have been careless in handling the stuff, and spilt almost the whole amount.

REPRESENTATIVES of cold storage warehouses in various parts of the country met for discussion of matters relating to the trade, on March 30, at the Hotel Iroquois, at Buffalo, N. Y., S. Baily, Jr., of Pittsburg, being president and Homer McDaniels, secretary. The houses represented in person were the Quincy Cold Storage Co., of Boston, Mass.; the Merchants' Cold Storage Co. and the Gansevoort Cold Storage Co., of New York; the Kings County Refrigerating Co., of Brooklyn; Capitol City Cold Storage Co., of Albany, N. Y.; Philadelphia Cold Storage and Warehousing Co., of Philadelphia, Pa.; Union Cold Storage Co., of Pittsburg, Pa.; Syracuse Cold Storage Co., of Syracuse, N. Y.; Buffalo Cold Storage Co., of Buffalo; Union Cold Storage Co., of Chicago, Ill., and Sheriff Street Market and Cold Storage Co., of Cleveland, Ohio. Thirteen houses were represented by letter. No formal resolutions were passed, but the general conclusion was reached that the rate on eggs should not be less than forty cents for the season for 30-dozen cases, and that the minimum rate for butter should be one-half cent for the season. The amount that could safely be loaned on goods in storage was discussed, 75 per cent of the cost of the goods at point of storage being considered the limit of safety. A committee was appointed to gather statistics in regard to cold storage. The subject of liquid air was discussed, but its impracticability for purposes of refrigeration was conceded by all.

[*Written for* ICE AND REFRIGERATION.]

PLATE ICE.

ONE FIRM'S EXPERIENCE WITH PLATE ICE—DIFFERENCE IN SYSTEMS EMPLOYED—SOME OBJECTIONS TO AND ADVANTAGES OF THE PLATE SYSTEM.

BY ARTHUR FREESTON.

THE above subject for discussion was suggested at the second annual convention of the Northern Ice Manufacturers' Association, held at Marion, Ind., on March 14, 1900, the proceedings of which were reported in the April issue of ICE AND REFRIGERATION.

No one having had actual experience in the management of a plate plant was present, but the statements were made that plate ice takes about twelve days to freeze, that the first cost of installation being greater than a can plant was an objection, and that a plate plant was not advised where steam instead of water power had to be used; but none of the advantages of plate ice for retailing were discussed.

In 1890 a 20-ton can plant was installed by the Ice Manufacturing Co., of Germantown, followed a year later by an addition of a 20-ton Smith plate system, in which steam was and is used as the motive power. The expansion coils were placed in separate freezing cells and were submerged in brine, which, however, was stationary. This was not the success anticipated, although the system was considered preferable to the can method. It was impossible to form ice of an even thickness, due to the failure to properly supply each coil with a like quantity of ammonia, and it required considerable attention to constantly adjust the expansion valves.

There are many other disadvantages that led to the adoption of the Shipley brine circulating system. The expansion coils were removed from each of the freezing cells and submerged in a separate brine tank, distributing the cold brine from this tank into each of the freezing cells. The objectionable features of the plate plant were entirely overcome, and without any other changes whatever the output of the plate plant was increased to thirty-three (33) tons a day during the summer months.

In 1899 a still further extension of the plate plant was made by introducing a larger compressor and adding to the freezing and condenser surfaces, the present total output being altogether about eighty (80) tons a day. During this time the can plant was not extended, and we would not think for one moment of investing any money in the can system beyond what is actually necessary to keep the present one in good order and condition.

Can ice cannot compete with the plate product, and competition was such that we were obliged to distribute the kind of ice the public preferred. The can ice is used almost exclusively by the butchers, etc., who prefer it because it can be packed more closely in their ice boxes, but not 5 per cent of our retail patrons will accept anything but the plate ice. Natural ice was distributed at the time our plant was not of sufficient capacity to provide for our demands, and at such times quits and complaints were quite

numerous. The plate ice sells at all times in car load lots at a higher price than the can product. Can ice cannot be successfully stored, as it is frozen in four directions; that is, from each of the sides of the can toward the center. When removed from the brine tank the temperature of the center of the cake of ice is about 32° F., or freezing point, while the sides approach the temperature of the brine in which the can is submerged, usually 12°. When the cake of ice is stored, the temperatures begin to equalize, the center becoming colder and the sides warmer. Expansion on the sides and contraction in the center is the result, and these internal forces become apparent when the ice is exposed to a temperature above the melting point. It shatters, becomes honeycombed and cannot be split or cut like natural ice. Therefore can plants are usually run through the summer months only, and if operated during the winter months only such quantity of ice is made as will provide for the sales from day to day.

The amount of distilled water needed is a fixed quantity for each ton of ice produced. No matter what appliances exist for economizing the use of steam for power purposes, they are not valuable to a can plant, for the steam must be formed to secure the quantity of distilled water needed. It is the distilled water, and not the required power, that measures the coal consumption in the can system. The distilled water is not uniform in quality, and there is always one portion of a cake of can ice which, when melted, is at least unpalatable, if not decidedly objectionable, to taste and odor. Serve a customer one day in the year with this ice, and another quit or complaint is recorded.

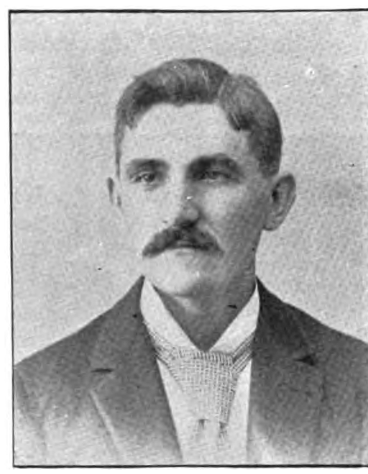
The power being continuous, the supply of steam and distilled water is also continuous, necessitating the regular removal of the ice from the can day and night, week day and Sunday. The demand is never regular, so that the ice not immediately removed must be allowed to melt, and in a day or two is unfit for use, unless stored in a refrigerated room, which adds to the expense of keeping it. In a plate system the freezing water is treated in such a manner that the air and impurities are expelled, and the water is frozen in a quiescent state. Chemical analysis of the water from the plate ice is more favorable than that of the can.

We consider the following advantages to be more than sufficient to warrant the additional expense of installing a plate system, viz.: Cost of production is less; the ice contains no core, white center or objectionable taste, and is free from sediment or rust; it is perfectly clear, and does not become honeycombed when stored; it can be stored without the aid of refrigeration, and keeps as well as and splits like the natural product, being superior to the very best eastern ice in appearance; it can be drawn from the tanks when ready to load the wagons, and if the demand is unusually great two or more tanks can be drawn, thus avoiding waste and accumulating for the heavy demand, and able to adjust the supply to a very helpful extent; no ice need be harvested on Sunday; the shutting down of the machine does not interfere simultaneously with the supply, as the ice may be drawn, even if not of the standard thickness; being operated throughout the year, the factory organization is not liable to be disarranged every season, and sufficient additional ice is made in winter at the least cost to offset the loss in storing; there is less wastage in harvesting plate ice than can ice.

From the experience at our plant we can hardly understand how it is possible for a man having used a plate plant ever to invest a dollar in a can plant, where he is, or is liable to be, subject to competition.

HUGH H. DAVIS, DECEASED.

HUGH HAMLIN DAVIS, of T. H. Davis' Sons, the popular meat and ice merchant of Gallipolis, Ohio, died Friday, March 16, of appendicitis. Mr. Davis was born at Pomeroy, Ohio, in 1863, and was educated there and at Poughkeepsie, N. Y. Engaging in business with his father, T. H. Davis, at Middleport, Ohio, for a time, he went south to Tennessee, and for four years acted as superintendent for the Tennessee Paving Brick Co. In 1897 he returned north, and, as manager of T. H. Davis' Sons, engaged in the ice and meat trade at Gallipolis, Ohio. The ice was manufactured at the T. H. Davis plant, in Pomeroy, Ohio, and during the comparatively short time Mr. Davis carried on the business at Gallipolis he built up a large ice trade. He was very genial and very energetic, and had a host of friends. He was a member of the Presbyterian church, and of a number of social and fraternal societies. He is survived by a window and four children.



THE LATE HUGH H. DAVIS.

AS an evidence of the absurd statements sometimes published, and which have their effect upon minds ready to be thus influenced, the following from the British paper, *Sanitary Record*, is a "corker." After speaking of the injurious effects likely to result from eating meats that had been kept "for weeks or months," this able critic says:

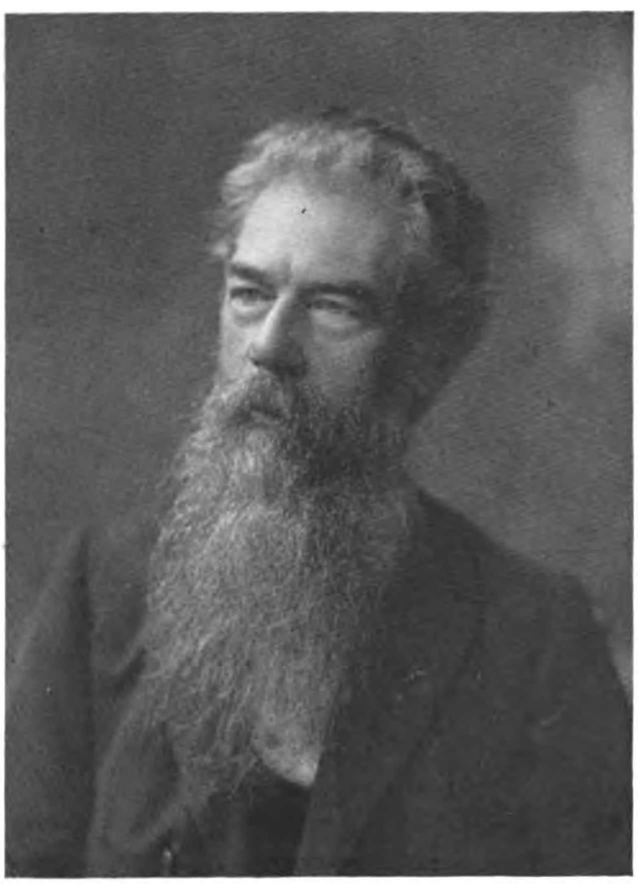
> Should a person attempt to live on cold storage foods alone, he would soon have indigestion, diarrhœal troubles, lose weight, and suffer those indescribable pangs which accompany chronic want. In time he would starve to death. The diarrhœal disturbances so common at summer resorts, and usually ascribed to change of water or climate, are in most cases due to the innutritious character of cold storage food.

This will be news to many who, on board ship and other places, have lived and thrived on cold storage foods for months. Presumably this authority had never heard of the Siberian mammoths, whose flesh, embedded in the Arctic ice, and thus "kept" not for months, but for unknown centuries, was eaten, and that without injurious effects to the eater. Fortunately, the time has passed when such a diatribe as the above will be taken seriously by civilized human beings, although some may be frightened into unnecessary alarm over imaginary evil by such a report.

NEW BOOKS.

MACHINERY FOR REFRIGERATION. By Norman Selfe. Chicago: H. S. Rich & Co. 1900. 8vo, cloth; pp. 416. Price. $3.50.

This work is modestly characterized by its author as "Being sundry observations with regard to the principal appliances employed in ice making and refrigeration, and upon the laws relating to the expansion and compression of gases; principally from an Australian standpoint." As a matter of fact, this book can lay claim to a great deal more; it is a work that treats fully of practical refrigeration and the machinery used in its application, and contains twenty chapters describing every type of modern refrigerating and ice making machine and appliance, with a very complete topical index, and with over 200—mostly full page—illustrations. The author, although a resident of Australia, has traveled extensively in the United States and Europe, and shows himself not only fully conversant with all the different systems of refrigeration, but also an unprejudiced critic of their various merits and advantages. It is not the intention of the author to dive deeply into the thermodynamic principles involved in the operation of refrigerating machines; nevertheless the book contains a great deal of matter relating to the construction and practical working of such machinery, as well as to the distinctive characteristics of different refrigerating systems, which is here presented either in a new shape or for the first time, and the information is of such character that it will prove to be of great service to the average ice or cold storage man who wants to produce the greatest amount of cold with the least primary investment of capital, the smallest cost of maintenance and the lowest working expenses.



NORMAN SELFE, M. I. C. E., M. I. M. E., ETC.

The author, whose portrait is shown herewith, reproduced from a late photograph, holds an international reputation as a refrigerating engineer and expert, and in electing to have his valuable book published in the United States he has shown not only good business judgment, but has paid a high compliment to the publishers. In short, the experienced ice manufacturer or cold storage warehouseman, as well as the novice seeking to enter either of these fields of industry, will find in "Machinery for Refrigeration" a *vade mecum* of the practical facts about the machinery and systems for producing cold by mechanical means, with which he ought to be familiar for the sake of comparison, or from among which he must choose that which is best adapted to his particular needs or purposes. How can one choose wisely without knowledge?

GRUNDRISS DER ALLGEMEINEN CHEMIE. Von W. Ostwald. Leipzig. Verlag von Wilhelm Engelmann. 1899. 8vo. paper; pp. 549. Price, M. 16; in cloth, M. 17.20.

While this volume is published as the third edition of Ostwald's well known work on general chemistry, it must not be assumed that it is simply a revised or enlarged issue of the former edition; it is, in fact, a new book.

At the time of the first edition of this excellent book (1889), that branch of chemistry known as theoretical, physical or general chemistry still consisted in the knowledge of a number of more or less isolated relations between certain physical and chemical phenomena, which were about to be collected into an independent scientific discipline. However, there were many missing links, most of which have now been filled by the experimental and theoretical researches made since, chiefly by the author and his school of followers and collaborators. The author's well known monthly magazine, devoted especially to physical chemistry, also gave material assistance in this direction, so that at present we can look upon an almost complete edifice, the fundamental outlines of which are clearly and fully exposed in this volume.

With almost the only exception of some structural hypotheses and analogies, and their fruitful application in synthetic research, chemistry was, and is still, essentially an empirical science, of which general chemistry was but a side issue. This condition of things is about to be reversed, and, if we may judge by the progress of the past, the time is not far distant when all questions of applied chemistry will be answered on the basis of this branch of the science of energetics, so fitly termed "Rational Chemistry" by the author. Indeed, it is one of the new departures of the present edition of Professor Ostwald's work to stimulate the practical application of those branches of general chemistry which are already fully matured.

While for historical and experimental details the author's larger work on the same subject may be consulted, the present work is eminently fitted to convey a thorough fundamental knowledge of general chemistry, not only for chemists, but also for those in other vocations in which these modern concepts are not only applicable, but indispensable at the present day. This also refers to the engineering profession, and more particularly to the refrigerating engineer, for, among others, the properties of the gases used as refrigerating media are especially amenable to the laws and tenets of general chemistry.

PRINCIPLES AND PRACTICE OF ARTIFICIAL ICE MAKING AND REFRIGERATION. By Louis M. Schmidt. Philadelphia: Philadelphia Book Co. 1900. 8vo, cloth; pp. 224. Price, $2.50.

Judging from the preface and the table of contents, we were led to expect from this book a comprehensive discussion of artificial refrigeration, but were somewhat disappointed in finding that most of the topics were treated rather aphoristically, giving hardly more than an encyclopedic review of the subject. Besides the trade catalogues, from which most of the illustrations in this book are taken, the author gives special credit in the preface only to two publications, rather distantly connected with the refrigerating industry, while no mention is made of ICE AND REFRIGERATION, which has heretofore published many of the plates, tables and other information contained in this book. Perhaps this is to be explained by the author having obtained his information at second or third hand.

LIQUEFACTION OF GASES. By Willett L. Hardin, Ph.D. New York: The MacMillan Co. 1899. 8vo, cloth; pp. 250. Price, $1.50.

In this volume Professor Hardin has made an important contribution to the available literature on the rise and development of the science and practice of liquefying gases. Although written in a popular science style, it will be found valuable to the student; first, because it collates the scattered bits of information, and gives them in a systematic and available shape; and, second, because of the numerous foot notes referring to the original literature from which the data were obtained. Beginning with the early history, the account of the researches and experiments is given from a period antedating the Christian era, up to the recent work of Linde, Dewar, Hampson and Tripler. Its calm scientific tone and the absence of mere technicalities will make this an acceptable hand book for the average student or seeker after data on this subject.

ANSWERS TO CORRESPONDENTS.

CAROLINA PINE FOR INSULATING WALLS—SPEED TO RUN COMPRESSOR—INSULATION FOR ICE STORAGE ROOM—REMEDY FOR FROSTING BACK TO COMPRESSOR, ETC.

[This department of ICE AND REFRIGERATION is conducted for the benefit of the trade generally, as well as individuals; and all competent inquiries will be given timely and proper attention, precedence in all cases being given to such questions as are of general rather than of individual interest. Correspondents will please write only on *one* side of the sheet. Persons desiring to communicate with correspondents using this column will do so by addressing them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago. All communications to this column are treated as confidential, and the names of the writers will not be disclosed without their permission. Anonymous communications will not be answered in this column.—ED.]

CAROLINA PINE FOR INSULATED WALLS.

To the Editor: Can hard pine or North Carolina pine be used with safety in the lining of insulated walls of cold storage partitions, the finishing of all ceilings, walls and floors being of spruce? The rooms thus partitioned to be used for the storage of butter, eggs, cheese and general storage. H. W. T.

ANSWER.—From the inquiries we have been able to make there appears to be no reason why Carolina pine should not be used with safety for the lining of insulated walls of cold storage partitions.

SPEED TO RUN COMPRESSOR.

To the Editor: Kindly answer the following in the column "Answer to Correspondents": At what speed in feet per minute of piston do you consider best to run an ammonia compressor, on the dry gas system, such as the Frick Co.'s, leaving suction and discharge valves out of the question? Also how many revolutions per minute do you consider the maximum safe number to run an ammonia compressor at, working on the same system, *i. e.*, dry gas, so as not to be injurious to the suction and discharge valves? M. R.

ANSWER.—The piston speed per minute governs the number of revolutions, and *vice versa*, and, other circumstances being equal, they are made dependent mainly on the size of the machine. Generally speaking, the revolutions vary from 60 to 90, the latter number applying to small machines up to five tons and less, while in those having a capacity of from fifteen to sixty tons, the number of revolutions are from 70 down to 60 per minute. For a stroke of twenty-eight inches the latter number of revolutions corresponds to a piston speed of $\frac{60\times2\times28}{12}=280$ feet per minute.

PIPING FOR COLD STORAGE.

To the Editor: Please answer in your April paper the following: What are the latest rules or accepted practice for piping rooms, say for direct expansion, from one inch to two inches per cubic foot? I have Mr. Skinkle's book, "Practical Ice Making and Refrigerating," but he does not give the rule for one inch direct expansion. I have a small plant near here, and think of putting in cold storage, and want to know how much 1-inch pipe it would require to pipe it; the room is or will be about thirty feet long, twenty feet wide and eighteen feet high; temperature about 30° to 34°. Also, how much pipe for same room, in case I want to turn it into a sharp freezer, say from zero to 20°? B. W.

ANSWER.—The piping requisite for a given space to be refrigerated would depend entirely upon the character of the insulation of the said space. To illustrate, it may be said that a well insulated room can be operated satisfactorily at a given required temperature with less than half the amount of pipe surface that would be required in a poorly insulated room, or in a room where the doors were constantly opened.

Accepted practice allows an average of ten cubic feet of space to be refrigerated to one lineal foot of 1-inch pipe, for temperatures ranging from 32° to 34° F., and five cubic feet of space to be refrigerated to one lineal foot of 1-inch pipe, for temperatures ranging from zero to 5° F., with first-class insulation in both instances.

In order to give you an intelligent idea of the factor of insulation in a calculation for piping cold storage rooms, we cannot do better than to quote from Professor Siebel's table of piping required, taken from the "Compend of Mechanical Refrigeration," third edition, page 177. Using 10,000 cubic feet of space as a basis, which is about the space you specify, Siebel's table shows the following number of cubic feet of space to allow for each foot of 1-inch pipe, on direct ammonia expansion:

Insulation	0	10	20	30	Degrees Fahrenheit.
Excellent	1.7	6.0	10.0	13.	Cubic feet of space to each lineal foot of 1-inch pipe.
Poor	0.85	3.0	5.0	6.5	

From the above you will readily appreciate that insulation is the prime factor for consideration in calculating pipe surface for cold storage space. We have known of cases where one lineal foot of 1¼-inch pipe was allowed for holding zero temperature to each ten cubic feet of space, but the insulation in such cases was approaching absolute perfection, far better than the average of cold storage insulation construction.

INSULATION FOR ICE STORAGE ROOM.

To the Editor: We are going to build an ice storage in connection with our plant, with a capacity of 350 tons. I would like to build with the view of turning the same into cold storage at some future date, if the town ever grows to it. We will build 40×45 feet, 20-foot posts; studding, 2×6; drop siding on outside, common oak native boards on inside; then building paper and another course of inch boards. Between siding and first course of boards filled with locomotive breeze. Now I want to find out if my plan will keep ice; and if not, can I get some little book on the subject, or can you give me a better idea? I expect to have large ventilator on roof, no floor, six inches sawdust on ground. I don't want to go to the expense of getting plans and specifications if I can help it, as we are poor this spring, but have to build ice storage. D. H.

ANSWER.—We think that your suggested plan of insulation for an ice house would not keep ice satisfactorily. You contemplate using 2×6 studding, with drop siding on the outside, common board native oak inside, then building paper and another course of boards, between siding and first course of boards (or in other words, between the studding), the space to be filled up with locomotive breeze. This would make a 9-inch wall twenty feet high, and we are of the opinion that it would not do at all for first-class ice house insulation. We would recommend building the walls with three or more dead air spaces, with double boards and double saturated insulating paper laid one-half lap on each division between the air spaces. If you will refer to the following articles published in our columns you will get a clear idea of the class of insulation construction we recommend for ice house and cold storage house construction, viz.: The "Ice Storage House" article, in September, 1899, issue, page 167; "Ice House" article, in October, 1899, issue, page 232; "Insulation" article, in November, 1899, issue, page 317.

Where floors are not used in ice houses, which is very frequently the case where the houses are located well above drainage, we recommend first tamping in from eighteen to twenty-four inches of cinders over the ground, and then laying about a foot of clean, dry mill shavings over the cinders, and laying loose boards over the shavings, on which to bed in the

ice. We prefer shavings to sawdust, as when sawdust becomes wet or moist it is the almost universal result that the sawdust will ferment and become as hot as any decomposing vegetable matter, thereby producing bottom melting in the ice house, while we have never learned of a single instance of fermentation in moist shavings; consequently we would give the preference to shavings. The construction you suggest would undoubtedly be cheaper than those specified in the articles above referred to, but those we recommend would prove the cheapest in the long run, particularly as you contemplate putting up a building for both ice storage and cold storage and for permanent use.

REMEDY FOR FROSTING BACK TO COMPRESSOR.

To the Editor: Our storage rooms are cooled by direct expansion, and we are troubled continually by the return frosting back to machine, and cannot regulate it by the expansion. We inclose you two sketches—one showing the return pipe as it now is, and another showing an arrangement we thought would overcome our difficulty. We are not certain just what we would get into by the proposed change, and your advice in the matter would be highly appreciated.

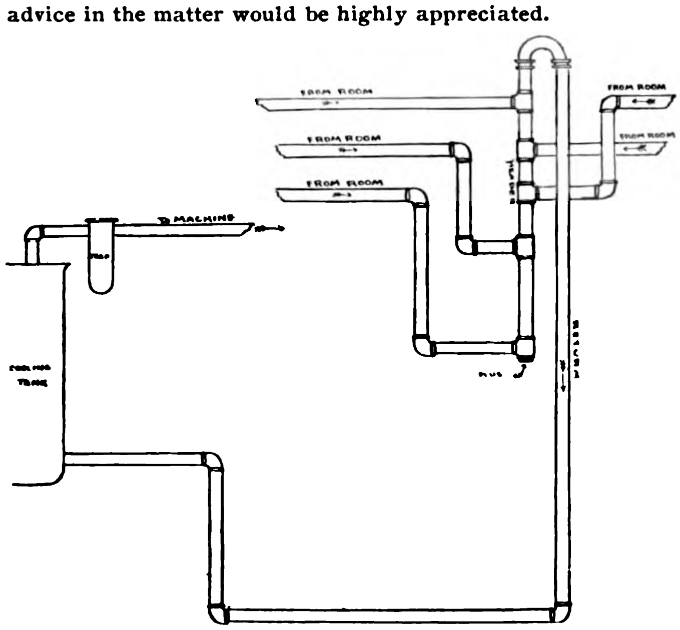


FIG. 1—SKETCH SHOWING PRESENT CONSTRUCTION OF RETURN PIPES FROM STORAGE ROOMS.

The only other solution to the matter that presents itself to our mind would be to run our return line for storage rooms back through one of the coils of our brine ice tank. To do this, we might accomplish our purpose of preventing frosting back to our compressor, but we would, we suppose, lose somewhat of the efficiency of our brine tank, which would be equally bad. The great objection to the frosting back is the chilling and contraction of compressor heads, which causes a loss of ammonia. We do not know how this could be prevented. D. I.

ANSWER.—In our opinion the change you propose making in the connections to the returns from your cold storage rooms would not materially alter the operations of the plant, nor would it have a tendency to prevent the frosting back to the compressors materially. It is true that as you have the connections made at present any excess feed to any one of the five rooms would result in liquid flushing over to the trap in the pipe between the rooms and the cooling tank, which would necessarily result in evaporation and expansion at a point close to the tank. Or if the trap in the pipe were completely filled with liquid the liquid would flush over into the coils in the cooling tank, and the frost could not be prevented from traveling over to the compressors. The plan of the proposed change in the connections shows a rise in the return main to a point above the highest connection to the rooms. This would have a tendency to trap the excess feed of liquid in the circulating pipes in the rooms; but as three out of the five connections to the main show a drop from the connections to the rooms to the riser pipe, the chances are that excess liquid would collect in the riser pipe by natural gravity drainage, and a pressure of gas from the room piping would have a tendency to force the liquid so collected up over the goose neck and into the trap in the piping below the room connections. The result would be much the same as with your present connections.

One way out of this difficulty would be to put a large collector or trap on the foot of the riser pipe, at the point where you show a tee plugged. Take the tee without the plug and extend the pipe down and place the collector or trap on the down pipe, at the lowest point in your building, so that all excess liquid would collect in the collector or trap; have a valve just above the collector, so that the connection can be closed off when the trap fills up, and make a connection from the top of the trap to the suction side of the

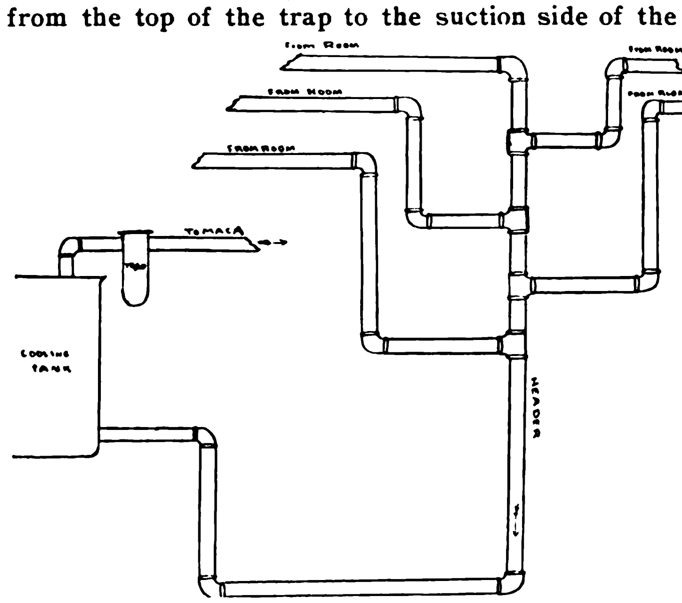


FIG. 2—SKETCH OF CHANGE PROPOSED BY OWNERS.

compressors, so that the liquid in the trap can be evaporated and pumped out. It would be well to have the collector stand in a tank or jacket, so that warm water can be circulated around the collector, to rapidly evaporate any liquid that may lodge in the collector; otherwise it would take a considerable time to exhaust the collector in case of its becoming filled up with liquid. The liquid would be cooled down to a very low temperature by its own evaporation, consequently it would evaporate very slowly, particularly when the outside of the collector would be covered with heavy frost. But if warm water is circulated around the collector the liquid would evaporate rapidly and the collector could be exhausted in a comparatively short time.

In regard to your "other solution" we would say, that the objection to carrying the return from the rooms back through a coil in the freezing tank would be the fact that the temperature of the brine in the freezing tank—if operated as the average freezing tank usually is—would be from 12° to 14° F.; consequently you could not expect to have the return gas from the rooms leave the coil in the tank at a temper-

ature higher than the temperature of the brine in the tank, as the best that possibly could be accomplished by this plan would be the equalization of the temperature of the return gas with the temperature of the brine in the tank, and a temperature of 12° to 14° F. of the suction gas would certainly frost the suction right over and onto the compressors, unless the gas was carried through the cooling tank after leaving the coil in the freezing tank. It is more than likely that the equalizing of the temperature of the suction gas from the rooms with the temperature of the brine in the freezing tank would have a tendency to equalize the back pressure of the gas from

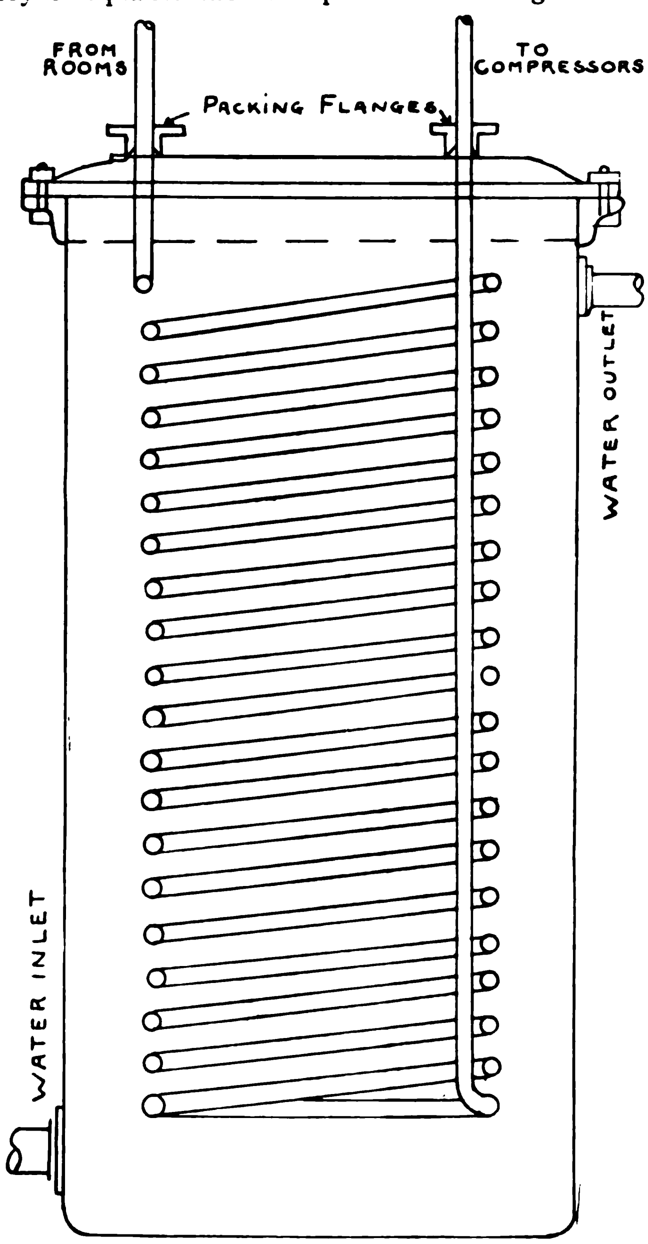


FIG. 2—CHANGE ADVISED IN THE ARRANGEMENT OF RETURN PIPES FROM STORAGE ROOMS.

both the freezing tank coils and the room coils, and this would prove beneficial to the extent of preventing, to a considerable extent, a difference in the back pressure of the suction gases from the two sources—a difference which it requires the most careful adjustment of the expansion valves to obviate, where the expansion coils are exposed to a wide difference in temperature of surroundings, as is the case with rooms standing at or near 32° and a freezing tank standing at or near 12° to 14° F.; and this difference must result in unequal back pressure and consequent backing up of gas pressure from the coils exposed to the higher temperature, to the coils exposed to the lower temperature, and in an irregular and imperfect circulation of gas throughout the entire system, as the surrounding temperatures vary and change.

Another way of preventing frost from working over to the compressors, and one that has been used to a considerable extent on direct expansion plants, is to place a water tank, containing a coil of pipe the size of the suction to the machine, on the suction line, near to the compressors, and pump the water used for condensing purposes into the bottom of the tank, and take the overflow water from the top of the tank to the condensers, the suction gas meantime passing through the spiral coil in the tank. This requires a tank with a tight cover, and when used care must be exercised never to run the suction gas through the coil without having the condensing water passing rapidly through the tank, around the coil; for, should the tank be full of water at rest, the water would freeze quickly and burst the tank, as has been done in one or two instances, to our knowledge. The connections to the tank and coils should be by-passed, so that when it is desired to run the water direct to the condenser, without passing through the tank, the gas may also bypass the coil in the tank, and go direct to the compressors. The water should always be drained from the tank when the tank is not in use. There is no gain to be made in this system of cooling the condensing water by means of the excess duty in the gas, excepting the bare gain of keeping the frost off the compressors, as every unit of heat that is taken out of the condensing water in this manner must necessarily be given to the suction gas and again given off to the condensing water at the condenser. It will, however, keep the frost off the compressors, and in some instances it has served to hold down the condensing pressure, where the initial temperature of the condensing water was extremely high in the summer season. We attach a sketch of the tank and coil, which will give you a good idea of the construction. It is an extremely difficult matter to keep the frost off the compressors of a direct expansion plant merely by regulation of the expansion valves. It can be done, it is true, but it requires such constant watching that it is almost impractical to attempt it.

Our impression is that you would better your plant materially if you would change your refrigeration from direct ammonia expansion to brine circulation in the storage rooms, utilizing a separate brine cooler for the brine used in the refrigeration circulation, and operating this brine cooler in a manner so that the suction gases from the brine cooler and from the freezing tank would equalize in temperature, and consequently in pressure; then carry the mingled return gases through the coils in the cooling tank, thereby utilizing the excess cooling duty of the gases to the fullest extent, and at the same time preventing the frosting over to the compressors. With the minimum amount of care and attention to the expansion valve regulation, as when the two brine temperatures are carried alike, the valves could be regulated in such a manner as to require no changing for hours and possibly whole days at a stretch, and at the same time the temperatures of the rooms could be controlled to any desired degree.

WATER REQUIRED FOR ICE MAKING.

To the Editor: We are considering the question of installing the necessary machinery for making six tons of ice in twenty-four hours. Will you kindly inform us approximately how much city water we will need in addition to our well water for this ice making, in addition to the eight tons of refrigeration we are now doing? We mean, how much during summer weather. We are told that for ice making four gallons of water, say at 75° to 80°, are needed per minute per ton of ice, and a gallon and a half per minute per ton of refrigeration. According to this, we would require thirty-six gallons per minute, less the amount saved by the use of the well water. The temperature of the well water now is 55°, and we are told that it would be the same in summer. The supply from the well, of course, is variable. We do not believe we can count on more than one gallon per minute. However, last summer our largest monthly water bill was for 310,440 gallons, about seven gallons per minute, or a saving of five gallons over the required twelve of city water alone. We must say, though, that our high pressure sometimes ran much higher than we have since been told was safe. We would like to give you more definite information, but hope you can give us some sort of rough estimate from these data. Our present well, lined with brick, is about three feet ten inches in diameter, thirty-three feet deep. What would you think of the attempt to increase our well water by digging a well in our cellar, say thirty feet long by six feet wide, having it walled up, and placing the ice tank over the top of it? The width of the cellar is about thirteen feet six inches, in this division, having 9-inch brick foundation walls on either side. Please inform us if this could be done without endangering these walls, and also in excavating for the tank whether we could safely go within thirteen inches of these walls, going down four or five feet, supposing it to be a clay soil. L. A. J.

ANSWER.—The solution of your problem we think may be made plainer and more correct by simply adding the total amount of water required for six tons of ice per twenty-four hours to the amount of city water which you are using now in addition to your well water. We think your assumption of four gallons per minute per ton of ice somewhat low, if the water is used in the usual manner without gradir-works or cooling towers, and should think five gallons would be nearer the practical truth. On this basis you would require about 43,200 gallons more per day than you do now, or, in all, about 1,600,000 gallons per month in addition to your well water.

If the proposed larger well will give you the desired amount of water it might be advisable to dig it, if the expense to do this is not too large. However, it does not necessarily follow that the increased area of the well will cause a corresponding increase of the water supply, and it is practically impossible to give you any definite information on this point—certainly not without some knowledge of the condition of subterranean strata and other local circumstances. The question as to how near you can go with the walls of the well and the walls of the ice tank, to the foundation walls of your cellar, depends also altogether on conditions which should be interpreted by a local architect who may be supposed to possess practical knowledge of the soil in your location.

SIZE OF BRINE COOLER.

To the Editor: Will you please inform me through the columns of ICE AND REFRIGERATION, what is considered the best proportions for ammonia condensers and brine coolers, where the ammonia is in the shell outside of the coils, through which the condensing water or brine to be cooled is passed?

How many square feet of coil surface are required in each case per ton of refrigerating power, and what ratio of area of pipe (cross-section) to length of run is best suited? A. M. T.

ANSWER.—We presume that you refer to the "double pipe" system of condensers, coolers, etc. As these devices are built in various forms and shapes, to suit the ideas of the people who make or use them, and as no two of them seem to agree as to square feet of pipe per ton of refrigeration, we do not see that we can be at all explicit in the premises.

There are two principal methods of building these devices, to say nothing of the many variations of each method. The first and oldest way is to have the ammonia and water, for instance, flow in the same direction. The second and more modern way is to have them flow in opposite directions. The same can be said of all applications of this device.

One of the great points made in the use of this device on ammonia condensers is that there is no slop of water, nor visible water, in fact. Still, the efficiency can be increased by having a condenser so constructed that water will flow over the pipes. It is claimed by the various patentees and makers of "double pipe" apparatus, that the linear feet of condenser surface can be reduced from 40 to 75 per cent, taking an open air ammonia condenser as comparison.

In ICE AND REFRIGERATION for March, 1899, Mr. Allan Campbell gave some excellent data on this subject, and we think a perusal of the article will shed considerable light on the subject for you. The application of the device in its various forms renders it impossible for us to give any rule that will apply to all cases.

AMMONIA METERS.

To the Editor: Kindly let us know who are manufacturers of ammonia meters, and give us the addresses. C. M. A.

ANSWER.—We do not know of any manufacturer of ammonia meters. In fact, we never knew of but two instances where meters were used for ammonia. One was for measuring the flow of liquid ammonia to the expansion valve, and the other for measuring the flow of expanded gas through the coils. In each case a pressure gauge was attached to the pipe immediately ahead of the meter. In the case of the liquid ammonia, a water meter was used, and in the case of the ammonia gas, a gas meter was used. In both cases all brass was removed from the meter, and cast iron or steel was substituted. It was found that the two meters used on the same system would not check up the same amount of work done. This was attributed to the coldness of the expanded gas in the gas meter, contracting the metal used in the meter, as well as the packings used.

THE REFRIGERATING SALT AGAIN.

To the Editor: In the Denver *Republican* of March 11 you will find an article by Prof. Rollin C. Wooster, of Newark, N. J., giving a description of his new discovery of a chemical for quick freezing. M. T. C.

ANSWER.—The article in question revamps the old and frequently exploded story of the man (his name in this case is Wooster) who has discovered some mysterious salt or chemical, by the solution of which in water refrigeration can be produced almost without cost. The fact is that refrigeration produced in this manner costs considerably more than the same amount of refrigeration in the form of ice. In certain cases these so called frigorific mixtures may be serviceable, and a number of them are specified on page 32 of the "Compend of Mechanical Refrigeration."

MORE ICE COMPANIES COMBINE.

REPORTS of consolidations among ice dealers continue in evidence. The Merchants' Union Ice Co., at Jersey City, N. J., was launched April 1, with a capital stock of $2,000,000 and a proposition to acquire all the available ice houses in and around Jersey City. William and Robert Scott, W. C. Fisk, W. L. McDermott and O. L. Gubelman are the organizers. At Reading, Pa., a company has been organized and incorporated under Delaware laws, with a capital of $730,000, presumably to secure control of the ice business in the section tributary to that enterprising burg. At Port Huron, Mich., the Consolidated Ice Co. has been formed and absorbs the Lake Huron Ice Co., Tunnel City Ice Co., St. Clair River Ice and Coal Co. and the Up River Ice Co. John B. Petit is president and manager of the new company, Geo. W. Jenkinson, secretary and assistant manager, and Geo. W. Moore, treasurer. The new company, it is stated, controls twenty-eight ice houses, all filled with ice, and will supersede all other ice dealers in that place.

Reports of a more modest undertaking come from Dunkirk, N. Y., where the various dealers have formed a combination among themselves for mutual protection, not, however, sacrificing their individuality as independent ice men. The most important change agreed upon was the determination to sell ice by weight instead of, as heretofore, by the week. At Grand Rapids, Mich., the Consumers' Ice Co., the Collins Ice Co. and the Crystal Springs Water, Fuel and Northern Ice Co. have bought up all but one of the smaller companies, and now the two latter have consolidated and are to be operated under the title Collins-Northern Ice Co., with Hiram Collins as president. This leaves practically but two companies in the field, who will endeavor to control the ice trade of this city, which has for some years past been in a demoralized condition.

NATURAL ICE NOTES.

——Phillips & Son, of Warren, Pa., have purchased the business of the Pleasant Ice Co., and merged it into their own.

——W. J. Daub, Paul G. Klinger, C. J. Ferrin, of Easton, Pa., and others, have organized the Pocono Ice Co. Rights have been secured, it is stated, on a large area of water near Naomi Pines, Pa., where houses, with a capacity of 100,000 tons of ice, will be erected.

——Arthur L. Staples, of Rochester, N. Y., has purchased the ice business of Frost & White, at Brattleboro, Vt. Mr. Staples and W. A. Shumway, who recently purchased W. F. Richardson's ice business, will consolidate and carry on business under the name of the Brattleboro Ice Co.

——The Cooke Stone and Ice Co. has been organized at Plainville, Conn., by John W. Cooke, Frank S. Neal and Irving S. Tinker, with a capital of $35,000, to succeed to the business of the late William Cooke. The company intends to erect another 3,000-ton ice house during the summer, to be supplied with all modern appliances.

——The Knickerbocker Ice Co., of Chicago, at its annual meeting, held April 4, reported having on hand a surplus of $242,228, after paying three semi-annual dividends of 3 per cent each on the preferred stock, and $5\frac{1}{2}$ per cent on the common. The total crop of ice available in the Chicago market, it is stated, is 200,000 tons less than it was a year ago. However, a year ago much more than that was left over in the houses at the close of the season.

COMPANY ELECTIONS.

——The Woodbury Ice and Power Co., Woodbury, N. J., has elected officers as follows: Charles Walton, president; D. V. Summerill, vice-president; J. J. Summerill, secretary-treasurer.

——The Clinton (Ill.) Ice Manufacturing Co. has elected the following officers: President, F. C. Wood; secretary, Fred Ball; trustee, R. Snell; directors, A. A. Parrett, Charles Hendricks and F. C. Wood.

——The stockholders of the York Ice and Refrigerating Co., of York, Pa., elected directors as follows: P. H. Glatfelter, George Motter, Forry Loucks, George Barnitz, John Alexander, W. H. Miller and H. W. Heffner.

——The Pocono Ice Co., Morristown, N. J., recently incorporated, has elected officers as follows: President, John B. Vreeland; vice-president, E. Le Clerc Vogt; treasurer, John B. Byram; secretary, Louis A. Vogt; general manager, F. Elwood Leonard.

——The Crystal Ice Co., of Davenport, Iowa, recently elected Ed. Berger as president, O. C. Woods as vice-president, and E. Wilckens as secretary. These, together with S. F. Smith, H. T. Denison, H. H. Vogt and W. A. Blair, form the board of directors.

——The Indianapolis (Ind.) Cold Storage Co., at its annual meeting, April 11, elected George G. Tanner, H. F. Stevenson and M. P. Woody, of Indianapolis, and A. C. Raymond and H. E. Cleveland, of New York, directors for the ensuing year. Samuel E. Kercheval was elected as vice-president.

——The stockholders of the Consolidated Ice Co., of Pittsburg, Pa., have elected officers as follows: President, Wm. Scott; vice-president, Thos. M. Rees; treasurer, W. F. Wilson; secretary, W. F. Melhuish. Directors: William Scott, A. W. Mellon, C. B. McLean, W. V. Callery, Thomas M. Rees, George M. von Bonnhorst and James McAfee.

——The Cincinnati (Ohio) Ice Co. has elected new officers as follows: John Broxterman, president; James Cullen, vice-president; Charles B. Russell, treasurer, and Lester Blair, secretary. These, together with Franklin Alter and Ben B. Dale, form the board of directors. It was decided at the meeting to reduce capital stock from $1,000,000 to $420,000.

——The Brooklyn Warehouse and Storage Co., Brooklyn, N. Y., has elected officers as follows: President, George W. Chauncey; vice-president, John R. Van Wormer; treasurer, Gen. Christian T. Christensen; secretary, Guy Duval; executive committee, William H. Wallace, Horace C. Duval, and Mr. Van Wormer; and directors, the foregoing, with Hon. Chauncey M. Depew, William S. Hawk, Henry N. Whitney, Herbert L. Bridgman, William B. Tubby, Joseph J. Almirall and John S. Frothingham.

NEW INCORPORATIONS.

——The Wilmington Ice Manufacturing Co., Wilmington, Del., to manufacture ice. Capital, $30,000.

——Reading Cold Storage and Ice Co., Reading, Pa., incorporated at Dover, Del., with a capital of $730,000.

——The Crystal Ice Co., Ft. Worth, Tex., incorporated by Sam. Davidson, J. V. Goode and L. M. Barkley. Capital, $30,000.

——People's Full Weight Ice Co., Chicago, Ill., incorporated by John Zeller, G. A. Berdel and A. D. Salomon. Capital, $2,500.

——City Ice Co., South Bend, Ind., incorporated by W. B. Hollingsworth, J. B. Lotshar and J. H. Beck, directors. Capital, $30,000.

——The capital stock of the Oklahoma Ice and Cold Storage Co., of Oklahoma City, Okla., has been increased from $35,000 to $50,000.

——The Sherman Ice Co., Sherman, Tex., has filed an amendment to its charter increasing the capital stock from $50,000 to $75,000.

——The Crystal Ice Co., Beaver Falls, N. Y., incorporated by W. H. and J. Anderton and C. W. Rohrkaste. Object, to manufacture and sell ice.

——Consumers' Light, Heat and Ice Co., Newport News, Va., incorporated by W. C. Stuart, R. W. Perkins, L. A. Meyers and others. Capital, $100,000.

——The San Pedro Fish and Ice Co., San Pedro, Cal., has been incorporated by J. E. Erchelberger, E. G. Robinson and I. F. Dickens. Capital, authorized, $75,000; subscribed, $18,000.

——The Ruemmeli-Braun Co. has been incorporated at Guthrie, Okla., by Albert Ruemmeli and Henry Braun, of Oklahoma, and Henry Surber, of St. Louis, Mo. Capital, $50,000.

——Merchants' Union Ice Co., Jersey City, N. J., incorporated by Wm. and Robt. Scott, W. Fisk, W. L. McDermott and O. L. Gubelman. Capital, $2,000,000. Object, to harvest, store and deal in ice.

——The Maryland Sanitary Refrigerating and Heating Co., of Annapolis, Md., has been incorporated by Chas. H. Basshor, D. M. Newbold, W. W. Varney, H. Cassard and O. L. Quinlan. Capital, $100,000. Objects, to supply refrigeration, as well as heat and ventilation, by means of pipes and conduits from a central plant.

IN a recently issued bulletin of the U. S. department of agriculture on "Dairying in California" attention is called to the rapid increase of creameries and of dairy herds. The conclusion drawn is that in the near future more attention must be paid to the export trade in order to find a market for the surplus, and prevent demoralization of prices at home. The want of refrigerated compartments on ocean transports, especially on the Pacific, made the problem a difficult one. Butter for export should be of particularly hard body and high melting point, the securing of which, it was shown, lay largely within the control of the feeder and butter maker. An increase in the stearin and palmatin, which are solids at ordinary temperatures, and a corresponding decrease in olein, which is an oil at ordinary temperatures, would cause butter to be harder, while changes of an opposite nature would make it softer. It was generally agreed that butter is made hard by the addition to the ration of a small amount of potatoes; cotton seed meal has a similar effect, but too much of it will taint the butter. One said oat hay and green corn fodder also have somewhat the same effect. On the other hand, linseed meal causes soft butter, and alfalfa hay when used alone does the same. An instance was given of a herd which had been fed on alfalfa and Bermuda grass, and was changed to a pasture of young barley that had dried up before it was fully grown. The butter immediately became very hard. A commission merchant reported that the butter from one of his shippers suddenly became hard and would not melt as readily as usual. Upon investigation it was found that the herd had recently been turned into a stubble field. California had in 1899 about 300 creameries, most of them well equipped and capable of doing good work. A number of them are supplied with ice or refrigerating machines. One of these California creameries, equipped with a 3-ton ice machine, made and packed three tons of butter in 3-pound cans for the U. S. S. *Oregon* when she made her famous trip around Cape Horn. The butter was made in the usual way, except a little drier, and was reported to have kept good till the last.

CREAMERY ITEMS.

——The Alton Creamery Co., of Alton, Kan., has been organized and incorporated with a capital of $5,000.

——The Sanitary Milk Co., Ann Arbor, Mich., have had plans prepared for the construction of a cold storage apartment.

——The Dover Creamery association at Dover, Minn., has been organized and will build a creamery plant, to cost between $4,000 and $5,000.

——The Apulia Creamery Co., Apulia Station, N. Y., has been incorporated by C. W. Miles, D. W. Blaney and D. W. French. Capital, $4,000.

——R. L. Miller, Macon, Mo., who now operates a creamery, has decided to build a new creamery, which he contemplates equipping with a refrigerating plant.

——Farmers near Hector, Minn., have organized a co-operative company, to be known as the Norwalk and Palmyra Creamery Association, with O. Johnson as president, J. B. Keltgren, secretary, and C. Glesener, treasurer. A creamery is being erected.

——The Penn Valley Creamery Co., near Nevada City, Cal., have decided to enlarge their plant, and considered favorably the proposition to put in a refrigerating machine.

——The Artesian Creamery Co., Pierre, S. D., has been incorporated with a capital of $5,000 by F. W. Bennett, C. E. Hayton, G. A. Vandervot, F. N. Thieson and E. Larson.

——A new creamery with a cold storage plant in connection is projected at Tekoa, Wash., Mr. Judson, industrial agent of the O. R. & N. Co. of Portland, Ore., having the matter in charge.

——The Continental Creamery Co., Beloit, Kan., has decided to erect a cold storage plant in connection with their creamery. The new building will be 18×40 feet in size, and suitably equipped.

——The Gahanna Creamery Co., Gahanna, Ohio, has been incorporated by C. Shull, W. A. Dorsey, J. Ogden, A. H. Ragshaw, F. M. Latta and others; capital stock, $5,000, to build and operate a creamery.

OBITUARY.

——John T. Welch, of Brooklyn, N. Y., well known to the ice trade of New York and of the Hudson valley, died at his residence in Coxsackie, N. Y., on Friday, March 30, 1900, of inflammatory rheumatism. Mr. Welch was born in Syracuse, N. Y., in 1859. He followed teaching as a profession for some years, and in 1883 came to New York as bookkeeper for an ice company. He gradually worked his way upward until he became president of the New York & Brooklyn Ice Co. He left this position, however, to engage in the ice trade on his own account, and at the time of his death held controlling interest in the Hudson River Ice Co. He was highly esteemed by his associates for his integrity, energy and kindly disposition. He is survived by his widow and four children.

——Stephen P. M. Tasker, of Tasker & Julius, cold storage warehousemen, at Philadelphia, Pa., died at his home in the Quaker city the last of March. Mr. Tasker was born in 1834, his father having been a member of the well known firm of Morris & Tasker, iron founders. At an early age young Tasker entered his father's works, and at the age of twenty-one became a member of the firm. The new plant of the company at Newcastle, Del., was erected under his supervision. Early in 1899, when the Newcastle plant was sold, Mr. Tasker, in company with Mr. Julius, erected the cold storage warehouse at Water and Arch streets, Philadelphia, which proved at once to be a very successful undertaking. Mr. Tasker was considered a very able mechanical engineer, and several important mechanical inventions were perfected by him and patented in this country and in Europe. His genial nature and liberal, generous spirit made him many warm friends who mourn his death.

THOMAS W. MOORE, superintendent of exhibits for the Pan-American exposition, to be held in Buffalo, N. Y., in 1901, desires propositions from manufacturers of ice making and refrigerating machinery for the erection of an exhibit at the exposition. The exposition company would engage to purchase such refrigeration as it may require for the fruit and other departments, and for cooling water for drinking fountains. There will be a large number of concessionaires, and the privilege of selling ice and refrigeration will be accorded to the parties erecting and operating a proper working exhibit. A large plant is not desired; in fact, the smaller the better, so long as it represents the very best methods of ice making and refrigeration. Preference in choice, other things being equal, will be given to machines simple in construction and best adapted for use in South America and the West Indies.

AMONG the exhibits at the Canadian Colonial building at the Paris Exposition, the Canadian commission intends to have an exhibit of cold storage goods in a cold storage plant provided with a glass front, so that the butter, cheese, meats, poultry, etc., may be seen by the perspiring summer visitors in all their cool attractiveness. Plans for the cold storage plant had been furnished by the Canadian government; but it is now stated the plant was not erected in accordance with the accepted plans, and some changes will be necessary before the exhibit opens.

[*Compiled for* ICE AND REFRIGERATION.]

THE ANNUAL PRICE LIST.

THE following schedule of prevailing prices, supplementary to the more extended list published in the April number of ICE AND REFRIGERATION, offers an approximately correct statement of the ice market for the season of 1900 in the places named:

ARIZONA.

Tucson.—Tucson Ice and Cold Storage Co.: No natural ice stored here, but some is brought a car load at a time. The ice factories have a combined capacity of thirty tons per day. The price, wholesale, is $5 per ton. Retail price at rate of $10 per ton. About 100 tons of ice are kept in storage as a reserve.

CALIFORNIA.

Los Angeles.—The Ice and Cold Storage Co., of Los Angeles: There is no natural ice stored within 600 miles of here. There are about 7,000 tons of manufactured ice in storage. The capacity of all the ice factories here is about 250 tons per day. Wholesale prices of ice in car lots range from $3 to $4 per ton; retail prices, from 25c. to 60c. per cwt. Owing to the extraordinary dry seasons for the past three years the outlook for the ice business is not as good as usual.

Needles.—Murphy Ice Water and Light Co.: We have about 1,000 tons of ice stored, and are producing 30-tons daily with our "Ball" ice machine having a market for our entire product. Ice is delivered and sold in this city at 1½ cents per pound, retail.

San Francisco.—Consumers Ice Co.: Retail prices, in quantities of 10 to 30 lbs., $1 per cwt.; 30 to 50 lbs., 75c. per cwt.; 50 to 100 lbs., 60c. per cwt.; 100 to 300 lbs., 50c. per cwt.; 300 to 600 lbs., 40c. per cwt.; 600 to 900 lbs., 35c. per cwt.; 900 to 2,000 lbs., 30c. per cwt.; 2,000 lbs. and upwards, 25c. per cwt. Capacity of all the ice factories combined, about 45,000 tons annually, which is about equal to the consumption; but as nearly one-half of the total consumption is of natural ice, the factories do not make up to more than half their capacity. Low grade coal, screenings, costs $5 per ton. The above rates are an advance on those of former years, when business was done at a loss.

FLORIDA.

Ocala.—East Florida Ice Manufacturing Co.: There is no ice stored here, the capacity of the factories being more than enough to supply the demand. Our price for coming season is about same as last year, viz.: $4 per ton in car lots, $5 per ton in ton lots, 50c. per 100 lbs. to families.

GEORGIA.

Atlanta.—Local papers: Wholesale prices of ice to packing houses and to peddlers have been advanced from $3 and $3.25 per ton to $4 per ton. Peddlers will have to pay 25c. per cwt. instead of 20c., as last year. Families will be supplied from wagons at 40c. per cwt.; if in 100-lb. lots, at 35c. per cwt.; in quantities of 10 or 15 lbs., at ½c. per lb.

ILLINOIS.

Chicago.—The Knickerbocker Ice Co.: Total amount of ice in all our houses, about 1,000,000 tons. Ice harvested of good quality, but thinner than last year. Prices, wholesale to markets and large consumers, $2.50 per ton. Retail prices about same as last year, *i. e.*, 1,000-lb. coupon books, cash, $2.50; credit, $3. These prices may be advanced to $2.75 and $3.25.

IOWA.

Sioux City.—Daily papers: The ice companies here have agreed to the following schedule for 1900: Fifty lbs. or less, at 50c. per cwt.; 50 to 100 lbs., 40c. per cwt.; 100 to 200 lbs., 35c. per cwt.; 200 to 400 lbs., 30c. per cwt.; 400 to 600 lbs., 25c. per cwt.; 600 lbs. and over at 20c. per cwt. By the ton the price is from 12½c. to 15c. per cwt. The retail price last year was 20c. for 100 lbs.

KANSAS.

Iola.—Iola Ice and Coal Storage Co.: Wholesale price of ice, $2 per ton, on track. By the ton, less than car load lots, $2.50 to $4 per ton. Retail prices, 20c. to 50c. per cwt. Very little natural ice was gathered, and that is thin and poor in quality. The outlook for the ice business is good.

MISSISSIPPI.

Biloxi.—Biloxi Artificial Ice Co.: There is no ice stored here. The ice factories have a total capacity of forty tons of ice daily. The prices are, wholesale, $7 per ton to dealers, $5 per ton to fish boats. Retail price to families, 50c. per 100 lbs. The prospect for business is very good, and will be good all summer if we do not have quarantine.

Canton.—Canton ice factory: Cash prices at factory are, 50c. for 100 lbs.; 30c. for 55 lbs.; 5c. for 8 lbs. From the wagons, 5c. for 6 lbs.; 30c. for 40 lbs.; 65c. for 100 lbs. Coupon books are supplied at twenty-five 6-lb. coupons for $1; fifty-two 10-lb. coupons for $3; forty-five 25-lb. coupons for $6; sixty 50-lb. coupons for $15.

MISSOURI.

Kansas City.—Daily papers: Retail prices for ice have advanced to 22½c. to 27½c. per cwt., where last year the same parties paid 15c. to 20c. per cwt. It is predicted that families will have to pay 40c. or 50c. per cwt., and perhaps more, next summer. Shortage in the amount of natural ice stored is given as the cause of the advance.

St. Joseph.—St. Joe Artesian Ice and Cold Storage Co.: About 20,000 tons of natural ice are stored here, against 70,000 tons last year, and about 5,000 tons of manufactured ice are in storage. The ice plants here have a capacity of eighty tons daily. Prices will be same as last year, *i. e.*, $4.50 per ton to large consumers, 40c. per cwt. to families. Prospects for business as good if not better than last year.

St. Louis.—Daily papers: A new schedule of prices has gone into effect by tacit agreement of the various ice companies, advancing the wholesale price of ice from $2 and $2.50 per ton to $3, and retail price from 25c. to 35c. per cwt. An official of the Griesedieck Artificial Ice Manufacturing Co. is quoted as stating that: "For the past ten years prices for ice have run approximately per ton as follows: 1890, $10 to $11; 1891, $5; 1892, $5; 1893, $2.50, owing to a heavy supply of natural ice; 1894, $4; 1895, $2 to $2.50, owing to large supply of natural ice; 1896, $4; 1897, $2.50, owing to a number of new factories springing up; 1898, $3; 1899, $2. This season I think $3 per ton will be the lowest."

NEW ENGLAND STATES.

Portland, Me.—The D. W. Clark Ice Co.: We have harvested 27,000 tons of ice; quality same as last year. About 67,000 tons are in all the houses, which represents a full harvest.

Sargentville, Me.—The Maine Lake Ice Co.: Amount of ice harvested, 20,000 tons, of excellent quality. No other ice stored here. New houses all full.

Hartford, Conn.—Local papers: The prices agreed upon for season of 1900 are as follows: 1,000 lbs. or over, at one delivery, at 25c. per cwt.; 500 to 1,000 lbs., at 30c. per cwt.; less than 500 lbs., 35c. per cwt.; 100 lbs. or less, at 40c. per cwt.; wholesale, per ton, $5, against $3 in 1899.

New Hartford, Conn.—Greenwood Ice Co.: Have harvested about 35,000 tons of ice of excellent quality—total capacity of buildings. Sell only at wholesale, and prices at this time are from 25 to 50 per cent higher than last year.

New Haven, Conn.—The Hygienic Ice Co.: The harvest in this region was only about one-third of an average harvest. One-half of the ice used will have to be imported. Present prices from 15c. to 30c. per cwt.; family trade, 50c. per cwt. Outlook is for fair prices, but not excessive.

NEW JERSEY.

Atlantic City.—Citizens Ice and Cold Storage Co.: The retail prices for ice here will be as follows: To families, 40c. per cwt.; to butchers, saloons, etc., 35c. per cwt.; to large hotels 30c. per cwt.; wholesale price, 15c. per cwt. No ice is stored here. The ice factories have a total capacity of about 160 tons daily. The hotel trade here is large, there being ten new very large hotels, twenty-five boarding houses, 300 cottages and fifty apartment houses.

NEW YORK.

Brooklyn.—Daily papers: The American Ice Co. has advanced the price of ice from 25c. per cwt. to 60c. per cwt. The wholesale price remains the same, viz., $4 per long ton, or 2,200 lbs. Customers taking less than ten tons daily pay $5 per ton. This advance applies also to New York city, where the raise is from 30c. to 60c. per cwt. The shortage of the natural ice crop is given as the reason for the advance. The American Ice Co. claims to have housed but 2,400,000 tons of ice, "which is 2,600,000 below the normal." "In an average year," the president of the company is quoted as saying, "we get 4,000,000 tons from the Hudson and 1,000,000 from Maine. This year the figures are 1,700,000 and 700,000 tons." New York and Brooklyn consume about 4,000,000 tons of ice per annum.

Dunkirk.—Local papers: Retail price of ice to families, 20c. per cwt.; meat markets, $2 per ton; saloons and druggists, $2.50 per ton; grocers, $3 per ton.

Lansingburgh.—Local papers: Ice dealers have agreed upon the following prices: To grocers, saloons, butchers, etc., 20c. per cwt.; to hotels, 25c. per cwt.; to families, from 30c. to 40c. per cwt.

Schenectady.—Local papers: 500 lbs. or more daily at 15c. per cwt.; 200 to 500 lbs., at 20c. per cwt.; 100 to 200 lbs., 25c. per cwt.; less than 100 lbs., 30c. per cwt.

OHIO.

Cincinnati.—Daily papers: By agreement of the Ice Delivery Co. and the Consumers Ice and Refrigerating Co. the prices for ice will be advanced 5c. per cwt. over last year's prices. Families will be supplied at 35c. and 40c. per cwt.; large consumers at 25c. to 30c. per cwt.

Ironton.—Crystal Ice Co.: Wholesale price of ice is $5 per ton. Retail price for lots less than 100 lbs., ½c. per lb. No natural ice is stored here; capacity of ice factories, twenty-five tons daily.

Massillon.—Artificial Ice Co.: Our prices for ice at retail are as follows: 10 to 25 lbs. at one delivery at 60c. per cwt.; 25 to 50 lbs. at 50c. per cwt.; 50 to 100 lbs. at 40c. per cwt.; 100 to 500 lbs. per week in 100-lb. deliveries at 35c. per cwt.; 500 to 1,000 lbs. at 30c. per cwt.; 1,000 to 2,000 lbs. at 25c. per cwt.; 2,000 to 4,000 lbs. at 23c. per cwt.; 4,000 lbs. and over per week at 20c. per cwt.

PENNSYLVANIA.

Wilkesbarre.—W. H. Pethick: Natural ice is put in direct from lakes for 90c. per ton on cars f.o.b. in city. Price at ice houses last summer, $1.40 and $2, cut to $1.25. Delivered to customers, $4 per ton, cut down to $3 by excessive competition.

Prices for 1900 not fixed. We ought to get $2 to $4 in ton lots, and for family trade from 5c. for 10 lbs. up to 30c. per cwt. Four ice factories here have a capacity of thirty-five tons daily. Ice men make no money.

TENNESSEE.

Chattanooga.—Chattanooga Ice Co.: The stories regarding the great advance in prices for ice during the season of 1900 are unfounded. A slight advance will be made, owing to the increased cost of the material used in ice making. The price will be about 20c. to 25c. per 100 lbs.

Memphis.—Daily papers: Prices for ice have been advanced as follows: Wholesale, 25c. per 100 lbs., against 10c. per 100 lbs. last year; retail, 40c. per cwt.; as against 15c. per cwt. last year. At factories last year ice was sold at 7½c. per cwt.; present price, 25c. per cwt. The advance is said to be due to advance in cost of fuel and material used in ice making, and to refusal of manufacturers to continue to do business without profit.

Nashville.—Excelsior Ice and Cold Storage Co.: Wholesale prices for ice will run from $2.50 per ton upward. Retail prices 25c. and 30c. per cwt. No ice is stored here. Capacity of the ice factories, about 350 tons daily. Outlook for a large volume of business good.

TEXAS.

Galveston.—C. B. Lee, lessee Neptune ice factory: There is no natural ice here, nor any manufactured ice stored. Prices for ice range from $6 to $8 per ton. The capacity of the ice factories is about 1,100 tons daily.

El Paso.—El Paso Ice and Refrigerator Co.: Wholesale prices for ice have slightly advanced, and now are: Under 500 lbs., 40c. per cwt.; over 500 lbs., 35c. per cwt. In car load lots f.o.b., $5 per ton at factory. Retail, 10 to 50 lbs. daily at 75c. per cwt.; 50 lbs. and over at 60c. per cwt. No natural ice is stored nearer than Las Vegas. About 500 tons of manufactured ice are stored. Capacity of ice factories, fifty tons daily. Outlook encouraging.

VIRGINIA.

Petersburg.—Jos. B. Worth & Co.: Present price of ice is 35c. to 40c. per cwt. for large lots (200 to 500 lbs.), while under 200 lbs. price is ½c. per lb. We see no changes imminent. There is very little natural ice stored here. The capacity of all the ice factories in our section is about forty-five tons per day. The outlook for business this season is not so good as in 1899.

WEST VIRGINIA.

Wheeling.—Wheeling Ice and Storage Co.: Wholesale price of ice at factory is $3 per ton; retail, to butchers, saloons, commission houses, etc., 25c. per cwt.; family trade, 500 lbs., coupon books (12½-lb. coupons), $2.50; 1,000-lb. books (25-lb. coupons), $4 per book; 2,000-lb. books (50 and 100-lb. coupons) $8 per book. About 4,000 tons of natural ice were stored here. The capacity of all the ice factories is 200 tons daily.

FIRE AND ACCIDENT RECORD.

——The large ice houses of Conklin & Sons, Madison, Wis., containing over 40,000 tons of ice, were destroyed by fire on the 19th ult. Loss estimated at $25,000; insurance, $10,000.

——G. L. Munroe & Son's two ice houses at New Canaan, Conn., were destroyed by fire April 6, together with some 4,000 tons of ice contained in them. Fire said to have been of incendiary origin.

——William T. James' ice plant at Flushing, L. I., was totally destroyed by fire March 31, entailing a loss given at $30,000. Insurance, $25,000. Fire supposed to have caught from a flue in the engine house. Plant is to be rebuilt at once.

——The refrigerator car shops of the Kansas City Car Works, at Armourdale, Kan., were destroyed by fire last month, entailing a loss of over $500,000. The Armour Packing Co.'s refrigerator cars were built at this plant. The works will be rebuilt.

——Two ice houses belonging to the Butte Ice Co., Butte, Mont., and one belonging to the Consumers' Ice Co., same place, were burned April 9. Loss on former given as about $30,000, on the latter, $10,000. Both fires said to have been of incendiary origin.

——The ice houses of the Lakewood Ice Co., of Lakewood, N. Y., on Chautauqua lake, were burned April 2, fire being caused by the accidental ignition of a kettle of hot tar while mending roof. There were 35,000 tons of ice in the building, most of which was ruined. Total loss given as about $40,000.

——The ice factory of Hauser & Boynton at Athens, Ga., recently destroyed by fire, is being rebuilt.

——The International Ice Co., Flatbush, L. I., who were under contract to supply ice to the Long Island state hospital and recently completed a plant for the manufacture of ice, has offered to sell its entire plant to the state for $2,103, less than the cost of materials used in construction. The plant, when completed, proved to have been built over quicksand and the company is evidently desirous of avoiding the expense of making good the foundation and of escaping the penalty for nonfulfillment of contract.

MISCELLANEOUS FOREIGN ITEMS.

——The Sunderland Cold Storage and Ice Co. has been organized at Sunderland, England, and capitalized at £25,000, to build and operate a cold storage and ice making plant at Sunderland, which has no facilities of this nature.

——Messrs. Ohlssons Cape Breweries, Ltd., who are making large extensions to their breweries at Cape Town, South Africa, have just placed a second order for a large refrigerating plant on the carbonic system, with J. & E. Hall, Ltd., of Dartford, England.

——New cold stores are to be erected by Messrs. Graves & Son, wharfingers, at Gunshot wharf, Tooley street, London, E. C. The building is to be 60×70 feet in size, four stories high, and equipped with the best modern appliances for the preservation of perishable food products.

——A new ice factory and cold storage plant is to be erected at Manchester, England. The Crystal Ice Factory, Ltd., has been organized, with a capital of £30,000, to manufacture ice and operate cold stores. W. Rothwell and J. J. Kearns, fish dealers, are among the organizers.

——New slaughter houses with cold storage plants in connection are to be erected during the coming season at Essen, Germany; also at Gostyn, Witkowo, Lautenberg, Wittemberg and Szegedin, Hungary. At the latter place the city engineer has been instructed to complete plans for a modern abattoir, to cost 300,000 florins (about $150,000).

——The City of Cork Steam Packet Co., who do a large business in bringing over butter from Ireland to England, have decided to have their steamship *Kenmare* and steamship *Glengarrif* fitted with refrigerating machinery. This work has been placed in the hands of Messrs. J. & E. Hall, Ltd., of Dartford, England, who are to fit the ships with their patent cold air carbonic system.

——The Gear Meat Co., of Christchurch, N. Z., have instructed Messrs. J. & E. Hall, Ltd., of Dartford, England, to convert to their patent cold air carbonic system their last remaining refrigerating machine on the air compression principle. When the conversion is completed, the new machine will be capable of freezing no less than 5,000 carcasses of mutton per day, which is said to be a record.

——The prefect of police in Paris has promulgated an order to all dealers in ice, which requires them to label all ice offered for sale, either as ice "for eating purposes" or ice "for industrial purposes." The former, if natural ice, must have been obtained from pure spring or lake water; if manufactured, must have been made from sterilized or distilled water. Severe penalties are attached for failure to label or for false labeling of any ice distributed.

——A new meat delicacy has recently been placed upon the London markets in the shape of Siberian partridges. The birds are shot in Western Siberia in the mountainous districts southeast of Omsk. Their food, it is said, consists of nuts, which gives the meat a very desirable flavor. The birds are killed under climatic conditions which insure their speedy freezing, and in this condition they are transported and delivered to the London cold stores, and thence to the markets.

——The Norwich Ice and Cold Storage Co., Norwich, England, has been organized with a share capital of £10,000, to engage in the manufacture of ice and conduct cold stores. Arrangements have already been made for a 5-ton ice making plant, and, as soon as a suitable site is secured, cold stores of 60,000 cubic feet capacity will be erected. At the outset only 30,000 cubic feet will be insulated, the remainder as the business may require. The directors are: W. F. Cockrell, W. S. Everitt and H. R. Everitt.

FRIGIFEROUS PARTICULARS.

——The Auburn Cold Storage Co., Auburn, N. Y., owned by H. G. Latimer, Jr., and A. E. Grant, is to be discontinued, it is stated, for lack of patronage.

——The Merchants' Cold Storage Co., Minneapolis, Minn., has leased the building, 304 and 306 Third avenue, north, and will fit it up as a modern cold storage plant.

——Local capitalists of Des Moines, Iowa, have been discussing the matter of erecting a cold storage warehouse in that city. A good field for such an enterprise is presented, Des Moines having no public cold storage facilities at present.

——The Standard Ice Manufacturing Co., of Philadelphia, of which Mr. C. W. Berger is president and Theodore Kolischer manager, has completed its new ice making plant on Twenty-seventh street, Philadelphia, and has begun the manufacture of ice.

——The steamship *Elihu Thompson* is being fitted up at Seattle, Wash., with refrigerating machinery in order to engage in the meat carrying trade from that point to Cape Nome, Alaska. Australian and Canadian frozen meats, as well as American meats, butter and other produce, will be carried.

——The new plant of the Marysville Ice and Cold Storage Co., Marysville, Cal., was completed and its first "run of ice" made April 2. The ice making capacity of the plant is ten tons daily. The cold storage department consists of six separate rooms, each capable of holding about one car load. An ice storage room, capacity 1,000 tons, is also provided.

THE following memoranda of projected ice factories and refrigerating plants, or of those in course of construction, and of improvements and betterments in existing plants, have come to our notice during the past month:

ALABAMA.

Montgomery.—W. J. Block has organized a company, to be known as the People's Ice Co., who will erect a 25-ton can ice making plant, contract for the machinery having been awarded to the York Manufacturing Co., of York, Pa.

Montgomery.—It is stated that a new company, of which R. Woolfolk, of Atlanta, Ga., is the promoter, is preparing to build an ice making plant here.

Selma.—E. Gillman is erecting a cold storage chamber for meats and produce, and will put in a 6-ton refrigerating machine, supplied by the A. H. Barber Manufacturing Co., of Chicago.

Uniontown.—Local business men have decided, it is reported, to erect an ice factory, and a company is being organized to develop the scheme.

ARKANSAS.

Hamburg.—The Monticello Ice Co. has been organized and is preparing to erect a 10-ton ice making plant. Bids on machinery, new or second hand, are asked for.

CALIFORNIA.

Mariposa.—W. N. Ten Eyck expects to establish an ice making plant in this city, and asks for bids on machinery, etc.

Pasadena.—A project is on foot to erect and operate an ice making plant at this point, which is much needed.

Stockton.—A plant for the manufacture of ice is being erected at the Matteson & Williamson works. It is to be equipped with machinery capable of making sixty tons of ice daily.

CONNECTICUT.

Bridgeport.—The Naugatuck Valley Ice Co., whose proposed plan for building an ice factory was mentioned in the March issue of ICE AND REFRIGERATION, has voted to increase its capital stock from $40,000 to $100,000, and has had plans prepared for a structure 140×40 feet, two stories high, first floor to be used for an ice making plant of fifty tons daily capacity, and second floor for cold storage. It is expected that the plant will be ready for operation by July 1, 1900.

Greenwich.—John Maher, ice dealer, has decided to erect an ice making plant. Buildings, 106×40 feet in size, are being erected, and will be equipped with a 15-ton ice machine, to be supplied by the De La Vergne Refrigerating Machine Co., of New York. Plant is to be ready for operation by July 1, 1900.

Middletown.—James Curran, ice dealer, is erecting a plant for the manufacture of ice, and has contracted with the De La Vergne Refrigerating Machine Co., of New York, for a 15-ton machine. The plant is to be ready for operation by June 1, 1900.

Norwich.—A company has been organized by Lorenzo Blackstone to build an ice making and cold storage plant on Market street, on the site of the old Thames hotel. Contract has already been made with the Frick Co., of Waynesboro, Pa., for an 80-ton refrigerating machine and a 30-ton ice making machine. The plant is to be ready for operation by July 15, 1900.

DISTRICT OF COLUMBIA.

Washington.—William D. Hall, Walter T. Weaver, Milton D. Hall, F. Baker Weaver and John L. Weaver, all of this city, have associated themselves together for the purpose of manufacturing ice. Contract has been awarded to the York Manufacturing Co., York, Pa., for one of the latest improved brine plate ice making plants of forty tons capacity. The plant will be located in Georgetown, between the canal and the Potomac river, and will be operated by water power.

FLORIDA.

Miami.—The Florida East coast Ice Co. has been organized by L. C. Oliver and others, and incorporated with a capital of $50,000. It is proposed to build a plant for the manufacture of ice here, and also one at some other point not yet determined.

GEORGIA.

Atlanta.—The various packing house representatives in this city, it is said, have united to build an ice making plant, to supply the ice used in the meat storage rooms.

Atlanta.—The Kimball hotel is to be equipped with a 7-ton refrigerating machine for ice making and refrigerating purposes, by the A. H. Barber Manufacturing Co., of Chicago.

Fort Valley.—W. H. Harris has begun the erection of buildings to house a 6-ton ice making plant. Machinery has been purchased and the plant is to be ready for operation some time in June.

Macon.—Thos. W. Troy & Co. is the name of a new concern recently incorporated, with a capital of $250,000, to manufacture ice, soda water, extracts, etc., and to do bottling and shipping.

HAWAII.

Honolulu.—It is reported that Messrs. A. A. Crosse, of this city, and J. C. Evans and J. S. Espy, of Whatcom, Wash., are about to erect an ice making and cold storage plant here.

ILLINOIS.

Capron.—The Elgin Creamery Co. is preparing to cool its plant and its cream for shipment by means of a refrigerating machine. Contract for a 10-ton machine has been made with the A. H. Barber Manufacturing Co., of Chicago.

Chicago.—Montgomery Ward & Co., wholesale merchants, are equipping their new building on Michigan avenue with a 3-ton carbonic anhydride refrigerating plant for cooling drinking water. The machinery is furnished by the Kroeschell Bros. Ice Machine Co., of Chicago.

Poplar Grove.—The Poplar Grove Creamery Co. is making preparations to ship cream to Chicago on a large scale, and in order to control the temperature before shipment will install one of the A. H. Barber Manufacturing Co.'s 6-ton refrigerating machines.

INDIANA.

Fairmount.—Philip Hamm, of Elwood, Ind., it is stated, has purchased the factory of the Enterprise Manufacturing Co., and will convert it into a plant for the manufacture of ice, with cold storage in connection.

INDIAN TERRITORY.

Chickasha.—The Crystal Ice Co., incorporated by Sam Davidson and J. V. Goode, of Ft. Worth, Tex., is erecting here an ice making plant of twenty tons daily capacity, the machinery for which was supplied by the Fred W. Wolf Co., of Chicago. The plant is to be ready for operation before June 1, 1900. Frank Brown will be the manager of the plant.

KANSAS.

Hutchinson.—The Hutchinson Ice Co., Emerson Carey, president, is improving its plant by the addition of new machinery, which will increase the capacity to twenty-five tons of ice per day.

Neodesha.—A. J. Griffin, of Lawrence, Kan., is erecting here a 12-ton ice making plant. A report that the same party also intends to build a plant at Cherryvale is declared by him to be untrue. The plant is to be operated as the Neodesha Crystal Ice Co.

KENTUCKY.

Princeton.—Pepper & Glover are arranging to build a plant for the manufacture of ice, to cost about $10,000, and ask for bids on machinery.

LOUISIANA.

Natchitoches.—Barlow & Nixon contemplate the erection of an ice making plant, and ask for prices on a 10-ton to 20-ton plant.

Opelousas.—Harry W. Wilcox intends to build a new ice making plant here, and is negotiating for the machinery for same.

MARYLAND.

Baltimore.—Bernheimers Bros. have equipped their meat and produce department with a 3-ton refrigerating machine, supplied by the Remington Machine Co., of Wilmington, Del.

Baltimore.—The Maryland Vacuum Ice Co. has leased property at 38 South Front street, and is erecting there a plant for the manufacture of ice on the vacuum system. An ice storage, 50×90 feet in size, with a capacity for storing 600 tons of ice, is also being erected.

Baltimore.—The Continental Building Co. will equip its new office building with a 10-ton refrigerating plant and complete system of piping for cooling drinking water and connecting up drinking fountains throughout the entire building. The machinery will be supplied by the Frick Co., of Waynesboro, Pa.

MASSACHUSETTS.

Provincetown.—The stockholders of the Provincetown Cold Storage Co. have voted to build and equip an ice making plant of ten tons' daily capacity at once.

Worcester.—The Worcester Brewing Corporation is preparing to equip its brewing plant with cooling apparatus, and has placed an order with the York Manufacturing Co., of York, Pa., for one of their 150-ton refrigerating machines, to be installed at once.

MEXICO.

Mexico.—A. J. Morris, of Kansas City, and Senors Terresas and Creel, of this city, all of whom are interested in the new International packing house plant at Chihuahua, Mex., have decided to erect a large cold storage warehouse in the City of Mexico. An ice making plant will also be built in connection with the warehouse.

MINNESOTA.

Minneapolis.—Nelson Morris & Co., meat packers, are erecting a cold storage warehouse at 516 Second avenue, north, the permit calling for a building to cost $12,000.

MISSISSIPPI.

Starkville.—W. C. Welborn is in the market for ice making machinery.

MISSOURI.

Carthage.—The Wells & Wiggins Grocery Co. are erecting new buildings, and expect to put in a cold storage room, 50×60 feet in size, but have not yet arranged for its equipment.

St. Joseph.—The Val Blatz Brewing Co. is preparing to erect a brick and stone structure at Fourth and Franklin streets, to be equipped and used as a cold storage warehouse. Estimated cost of building, about $25,000.

St. Louis.—The Union Brewing Co. is completing its new plant, and will have an 80-ton refrigerating machine installed by the Ice and Cold Machine Co., of St. Louis.

St. Louis.—The Mound City Ice and Cold Storage Co. is further improving its plant and increasing its facilities by the installation of an additional 40-ton refrigerating machine, supplied by the Ice and Cold Machine Co.

MONTANA.

Missoula.—The Garden City Brewing Co., formerly Steiger & Co., brewers, are making a number of additions and improvements in the brewery. Among these will be a 25-ton refrigerating plant, contract for which has been awarded to the York Manufacturing Co., of York, Pa.

NEW JERSEY.

Clifton.—H. Hohenstein, proprietor of the Clifton hotel, contemplates erecting an ice making plant in the near future.

Jersey City.—William Bender is building a new warehouse for the storage of provisions, and will equip same with a 25-ton refrigerating machine, to be supplied by the Allen Ice Machine Co., of Brooklyn, N. Y.

Sayreville.—The International Smokeless Powder and Dynamite Co., near here, has found it essential to use mechanical refrigeration in its plant, and has contracted with the Frick Co., of Waynesboro, Pa., for a 20-ton refrigerating machine for duty in the factory.

NEW YORK.

Brooklyn.—It is reported that a number of hotel men, butchers, etc., have formed an organization, which proposes to erect and operate a co-operative ice making plant. Alexander Jardin, of the Wyona hotel, Brooklyn, is the promoter of the enterprise.

Brooklyn.—D. W. Kaatze has decided to provide mechanical refrigeration for his milk depot, and has contracted with the A. H. Barber Manufacturing Co., of Chicago, for one of their 8-ton refrigerating machines, to be used for cooling milk and cream.

Buffalo.—Baines Bros., dealers in provisions, have decided to erect cooling chambers for meat and provisions, and will equip same with a 3-ton refrigerating machine, supplied by the Case Refrigerating Machine Co., of Buffalo.

Cuba.—W. C. Harris, formerly of Dunham & Harris, cheese dealers, will erect a cold storage warehouse with a capacity of 50,000 boxes of cheese, in the near future.

Haverstraw.—Thomas Finegan, brewer, has decided to equip his brewery with modern refrigerating apparatus, and has awarded contract to the York Manufacturing Co., of York, Pa., for a 10-ton refrigerating plant, to be installed at once.

Jamestown.—Harry Wilson, who has erected a small cold storage warehouse, will equip same with a 6-ton refrigerating machine, purchased from the Case Refrigerating Machine Co., of Buffalo, N. Y.

New York.—The Broadway Central hotel is to be equipped with a 10-ton refrigerating machine, contract for which has been made with the Buffalo Refrigerating Machine Co., of Buffalo, N. Y.

Port Jervis.—The Old Port Jervis brewery has been purchased by parties from New York, Baltimore and Port Jervis, who are now making extensive alterations, and will equip the brewery with a complete refrigerating plant, to be supplied by the York Manufacturing Co., of York, Pa.

Utica.—A stock company is being organized here, to be capitalized at $75,000, and to build and operate an ice making and cold storage plant.

Utica.—The Fort Schuyler Brewing Co. will cool its storage rooms by means of a 6-ton refrigerating machine, to be installed by the Case Refrigerating Machine Co., of Buffalo.

NORTH CAROLINA.

Hamlet.—The Hamlet Ice Co. is erecting a 25-ton ice making plant on the can system, the machinery for which will be supplied by the York Manufacturing Co., of York, Pa.

Raleigh.—The Raleigh Ice Co. is erecting the necessary buildings in which to install a 25-ton ice making plant. The machinery for the plant is now being built by the York Manufacturing Co., of York, Pa., and it is expected to have the plant in operation in the near future. The same company is also erecting a similar sized plant at Hamlet, N. C.

OHIO.

Cincinnati.—The Union Trust building, now being erected here, will have its drinking water system cooled by means of a refrigerating machine, contract for which has been awarded to the Triumph Ice Machine Co., of Cincinnati. The machine will also serve to cool a storage room for furs, etc.

Columbus.—Dennis Kelly Ice and Cold Storage Co. is enlarging its plant and is preparing to install two 60-ton refrigerating machines with thirty tons ice making and distilling system, and direct expansion piping for the cold storage rooms, all to be supplied by the Frick Co., of Waynesboro, Pa.

Toledo.—The Toledo Cold Storage Co.'s new plant, mentioned in the January issue of ICE AND REFRIGERATION, is nearly completed, and will have a capacity of 300,000 cubic feet of cold storage space. Two machines, one of 35-ton and one of 25-ton refrigerating capacity, have been installed. The ice making capacity will be fifteen tons daily.

Youngstown.—W. B. Reed and and J. P. Wickersham, of New Waterford, Ohio, are making preparations to build and operate a cold storage plant, the building to be 50×100 feet in size, and have a capacity for storing 10,000 barrels of apples or other fruits.

PENNSYLVANIA.

Philadelphia.—The Keystone Hotel Supply Co. will hereafter cool its provision stores by means of a 6-ton refrigerating plant, contract for which has been made with the Frick Co., of Waynesboro.

Philadelphia.—J. Wallace Hollowell, commission merchant, is preparing to equip his fruit storage rooms with one of the Frick Co.'s 4-ton refrigerating machines.

Waynesburg.—The Waynesburg Cold Storage Co., recently organized, with Frank Reese as president and general manager, and J. M. Spriggs as secretary and treasurer, is erecting a cold storage plant, which will be equipped with a 15-ton refrigerating machine and a 7-ton ice making plant by the York Manufacturing Co., of York, Pa.

RHODE ISLAND.

Bristol.—Arrangements are being made to put in an ice making plant at Rhode Island Soldiers' Home. Contract for a 3-ton ice machine has already been awarded to the A. H. Barber Manufacturing Co., of Chicago.

Narragansett Pier.—The new Northern hotel, being erected here, is to be equipped with 17-ton machine for ice making and cold storage purposes. The machine will be supplied by the A. H. Barber Manufacturing Co., of Chicago.

Westerly.—The Westerly & Watch Hill Ice Co. has been formed by T. D. Babcock, and will erect a plant for the manufacture of ice. Three buildings, 37×90, 12×27 and 30×30 in size, respectively, are being erected and will be equipped with a 15-ton ice machine, to be furnished by the Frick Co., of Waynesboro, Pa. The plant is to be ready for operation about June 30.

TEXAS.

Athens.—McDonald & Howell are erecting a new plant for the manufacture of ice, and have given contract to the A. H. Barber Manufacturing Co., of Chicago, for a 6-ton ice making machine, with boiler and engine complete.

La Porte.—The La Porte Ice and Canning Co. has been organized, with a capital of $50,000, for the purpose of building and operating a plant for the manufacture of ice and the canning of vegetables and fruits. A 10-ton ice plant is proposed, with cold storage in connection. C. H. Moore is secretary of the company.

San Saba.—Creasy, Moore & Longley will erect a small ice factory here, and have contracted with the A. H. Barber Manufacturing Co., of Chicago, for a 5-ton machine, to make ice and cool a small storage room.

Sherman.—A. L. Canfield proposes to erect an ice factory, and asks for bids on machinery for a 5-ton plant.

Schulenburg.—The Schulenburg Electric and Cold Storage Co. has been organized by Mr. Charles Anderson as outlined in the April issue of ICE AND REFRIGERATION. The company will begin, in June, the erection of a building, 150×300 feet in size, to be equipped for cold storage and ice making purposes, and be completed early in 1901. A 150-horse power engine, a 120-kilowatt dynamo and a 15-ton ice machine will be required.

VIRGINIA.

Colonial Beach.—It is currently reported that a new ice making plant will be built here this spring or early next summer.

Norfolk.—It is reported that William Miller, of Baltimore, contemplates erecting an ice making and cold storage plant on property owned by him here.

Suffolk.—J. S. Groves and others are trying to organize a company to build and operate an ice making plant.

WEST VIRGINIA.

Keyser.—Wm. MacDonald contemplates the erection of an ice making plant, and is securing bids on machinery, etc.

Parkersburg.—Local capitalists, it is stated, have organized a company with the intention of erecting and operating a cold storage warehouse and ice making plant.

Wheeling.—Louis Neibergall is enlarging his ice plant and increasing his storage facilities. An additional 30-ton refrigerating machine will be installed, supplied by the Frick Co., of Waynesboro, Pa.

WISCONSIN.

Milwaukee.—Robt. A. Johnston & Co, confectioners, have made arrangements to cool the atmosphere in their chocolate and storage rooms by means of a 6-ton CO_2 refrigerating plant, to be supplied by Kroeschell Bros. Ice Machine Co., of Chicago.

Milwaukee.—Weisel & Co., sausage manufacturers, have contracted with Kroeschell Bros. Ice Machine Co. for remodeling their carbonic anhydride refrigerating plant, and adding direct expansion coils for rooms with about 20,000 cubic feet of storage space.

MISCELLANEOUS.

——E. M. Henry & Co., Norfolk, Va., it is reported, wishes to purchase 5-ton or 10-ton ice machines for export.

——J. R. Young and R. J. Carlisle have organized a company at Dothan, Ala., and propose to erect a plant for the manufacture of ice.

——Messrs. Carlen, Flock & Buerger, Mobile, Ala., will equip their storage rooms with a 16-ton refrigerating machine, to be supplied by the Henry Vogt Machine Co., of Louisville, Ky.

——The Washington Cooling Co. has been organized at Washington, D. C., and proposes to lay conduits and pipes, and supply cooled air to residences or to cooling chambers in stores, hotels, etc.

——The Bremen Ice and Canning Co., of Bremen, Ga., has been organized by F. J. Steel, of Bremen, and J. K. Redwine, of Carrollton. A cannery is to be established, and later on an ice manufacturing plant erected.

——A. A. Jewett & Co., ice manufacturers and wholesale meat and provision dealers, are having installed in their ice plant a 200-ton ammonia condensing system. The work is being done by the York Manufacturing Co., of York, Pa.

——The Southwestern Dry Plate Co., of Corsicana, Tex., S. W. Bogy, secretary, which is building a factory for the production of photographic dry plates, will build in connection, it is stated, a storage room, and equip its plant with a 10-ton refrigerating machine.

EXPORTS OF ICE.

THE exports of ice during the month of March, 1900, amounted to 1,995 tons, valued at $2,599, as against 766 tons, valued at $1,489, for the same period of 1899. For the nine months ending March 31, 1900, the total exports of ice amounted to 10,898 tons, valued at $21,908, as against 18,559 tons, valued at $34,675, for a like period in 1899.

CONSOLIDATED ice companies do not find it smooth sailing in Texas. The Crystal Ice Co., of San Antonio, Tex., which was a consolidation of the Crystal Ice Manufacturing Co., the Southern Ice and Cold Storage Co., and the Butchers' and Saloon Men's Ice Manufacturers' Association, was declared in the District court to have forfeited its charter, because the consolidation was in violation of the Texas anti-trust law. Now the court of Appeals has affirmed the judgment of the District court. The latter court had appointed Eugene Holmgren as receiver for the property of the corporation.

THERE is no truth whatever in the reports current in the daily press that liquid air was used in a shipment of fruit from California to Kansas City last month. The rumor originated, perhaps, in the fact that shipments of fruit were sent at the time indicated where some of the fruit cars were not iced, but were treated instead with a special chemical, which, it is claimed, kills the fungi that cause rot. The process originated with Dr. R. R. Snowden, a chemist of Los Angeles, Cal. The treatment was experimental. There is no liquid air manufactured on the Pacific coast in commercial quantities as yet.

ICY ITEMS.

——The Brookhaven (Miss.) ice factory, which has been shut down for more than a year, has been thoroughly overhauled and started in operation. The daily capacity is seven tons of ice.

——Plumb & Winton, cold storage warehousemen, Bridgeport, Conn., are having a special chamber built and insulated by the Nonpareil Cork Co., of New York, for the storage of furs, clothing, etc.

——A cold storage warehouse, built on the "Dodge" system, is being erected at Scranton, Pa., for the Delaware, Lackawanna & Western R. R. It will have a capacity, it is stated, of 110,000 tons.

——Anson Jones has sold his cold storage plant at Albert Lea, Minn., to Smith, Wright & Son, of Williston, Vt., who will enlarge the house and use it for storage of poultry, eggs, etc., and as a branch of and feeder to their eastern business.

——There is a good opportunity for the investment of capital in a cold storage plant at Cape Charles, Va. The conditions are most favorable. The question is being agitated, and no doubt will result in the establishment of a plant.—*The Fishing Gazette.*

——The Saginaw Produce and Cold Storage Co., a company recently organized with Henry M. Schmidt, president, and mentioned in the March issue of ICE AND REFRIGERATION, has secured the cold storage building on Monroe street, Saginaw, will refit and enlarge the same and put in an ice machine.

——The Consolidated Ice Co., of Pittsburg, Pa., has let contracts for the erection of its new plant on Brushton avenue, mentioned in the February issue of ICE AND REFRIGERATION. It has also been decided to increase the capacity of the South Side plant from thirty tons to fifty tons per day.

——The Tropical Ice and Cold Storage Co. is the name under which the business of the company building the new 30-ton ice making plant at Tampa, Fla., mention of which was made under "New Plants," in the April issue of ICE AND REFRIGERATION, is to be transacted. F. H. Moore is the general manager, G. C. Edwards, secretary. The new plant is to be ready for business some time in June.

SHE'S "STUCK" ON AN ICE MAN.

Go an' tell all yer cares ter de ice man,
  Fer he has n't got nottin' ter do;
I 'm fer him 'cos he 's allus a nice man,
  An' he do n't tell his trubbles ter you.

He do blow hisself in ivvery mornin'
  Wid a chunk av th' cool fer me chist,
An' a smile that ' foriver a-bornin'
  Whin he tucks me doughnuts 'nath his vist.

An' he tells me how Kitty McLaughlin
  Quit her place, fer to marry a Swade
In th' pleece coort av old Justice Coughlin;
  Say, would n't that jar you—the jade!

Thin he clanes out me ice box so nately,
  An' doomps out me buckit av ash,
An' fills oop me coal hod so swately,
  Fer th' ice man is surely me mash.

He 's famished—he gets oop that early
  He cud ate a bull dog, an' that raw.
An' his appetite 's certainly burly;
  'Tis a show whin he 's workin' his jaw.

Whin I fix a lunch fer to take wid 'im,
  He 'll ring oop some wan's tillyfone,
An' tell me what good th' lunch did 'im,
  An' call me his darlint, his own.

Shure th' milk man 's not in it wid dat boy,
  An' th' coal man do n't stand four, five, six,
An' de gas man gits nottin but cold joy,
  An' de grocery boy—he's good fer nix.

Th' letther man 's good wid de missis,
  But he can't come around to der back;
An' it 's few dat Oi've had av his kissis,
  An' der not loike de ice man's warm smack.

An' th' ice man has plenty av money,
  So it's pasted Oi am an me Jim;
An' he calls me his darlint, his honey,
  So it 's me that 's fer no wan but him.

—E. T. S.

THE second annual meeting of the Massachusetts Ice Dealers' Association was held at the Hotel Bellevue, Boston, Mass., on April 17. About 100 ice dealers participated, President W. N. Eaton, of Quincy, presiding. Reports were read by the secretary, Elmer H. Bright. A banquet, or dinner, was enjoyed, after which addresses were made on the condition of the ice business and its future, followed by a general discussion.

EXPORTS OF PACKING HOUSE PRODUCTS.

SOME faint idea of the volume of the business done by the packing houses of the United States may be gained by glancing at a summary of the exports of meat products as shown in the recently published reports of the U. S. Bureau of Statistics. Thus, during 1899 the total quantities and values of meat products exported were as follows:

Fresh beef exported, year ending June 30, 1899	282,139,974 lbs.
Value of same in U. S. money	$23,545,185
Canned beef exported, year ending June 30, 1899	38,385,477 lbs.
Value of same in U. S. currency	$3,503,293
Salted or pickled beef exported	46,564,876 lbs.
Value of same in U. S. currency	$2,525,784
Salted or pickled pork exported	137,197,200 lbs.
Value of same in U. S. currency	$7,917,066
Bacon exported, year ending June 30, 1899	562,651,480 lbs.
Value of same in U. S. money	$41,557,067
Tallow exported	107,361,009 lbs.
Value of same in U. S. money	$4,367,356
Lard exported	711,259,851 lbs.
Value of same	$42,208,465
Hams exported	225,846,750 lbs.
Value of same	$20,774,084

That is, the United States packing houses, besides supplying a very large proportion of the enormous domestic demand, exported during the fiscal year ending June 30, 1899, 1,636,965,281 pounds of hog products and 367,090,327 pounds of beef products. These exports represent an estimated value, at point of shipment, aggregating $146,498,300.

An evidence of the influence of the refrigerating car and refrigerated compartments on board ship is shown in the fact that while the exports of fresh beef since 1890 show a gain of from 173,000,000 pounds to 282,000,000 pounds, the exports of canned beef show a decrease from 83,000,000 pounds in 1890 to 38,000,000 in 1899, and the latter figure would doubtless be still lower were it not for the extraordinary demand for canned beef, caused by the wars in the Philippines and in south Africa.

PACKING HOUSE NOTES.

——The John C. Roth Packing Co., of Cincinnati, Ohio, has increased its charter power, enabling it to make and sell ice.

——Charles Kahler and C. T. Kleder, of Elkhart, Ind., are building a sausage factory and cold storage plant at Milford, Ind.

——Arbogast & Bastian, packers, Allentown, Pa., are converting the third and fourth floors of their packery into cold storage rooms.

——The Swift Packing Co., of Chicago, is erecting new buildings at Negaunee, Mich., and will operate a branch packing house there.

——The Cudahy Packing Co., of Milwaukee, has commenced the construction of a building at Neenah, Wis., to be used as a market place and cold storage warehouse.

——J. J. Felin & Co., Philadelphia, Pa., are about to erect an addition to be used as a pork packing plant. The new building is to be 35×100 feet in size, four stories high, and will cost about $16,000, exclusive of equipment.

——It is reported that a company has been organized in Brooklyn, N. Y., for the purpose of erecting a refrigerating plant to cool the beef houses at Fort Green place, Brooklyn. It is proposed to lay pipe lines connecting the various houses at or near this point, and refrigerate their meat boxes by means of cold air forced through the pipes or conduits.

——The Pacific Coast Cold Storage Co., of Tacoma, Wash., has been organized, with a capital of $500,000, and has made arrangements to carry fresh meats to Cape Nome and other Alaskan points.

——Armour & Co. have secured a permit for the erection of a cold storage warehouse for meats, at Seattle, Wash. The building is to be a two-story brick and stone structure, and is to cost $30,000.

——The Schwartzschild & Sulzberger Co., packers, New York city, have purchased property at Forty-second street and Ashland avenue, Chicago, Ill., in the stock yards district, and will build there a large packing house plant.

——Jacob C. Dold, the Kansas City packer, has submitted a proposition to the Board of Trade at Fort Worth, Tex., offering to build a $1,000,000 packing house there if the citizens would subscribe to $250,000 worth of the stock.

——E. James & Son's pork packing establishment at Sharon Hill, Pa., has been enlarged and improved by the addition of new machinery, including a new ice machine, which increases the ice making capacity to forty tons per day.

——It is reported that owing to increased prices for ice, the packing houses at Denver, Colo., have decided to equip their plants with refrigerating machinery. The Burckhardt Packing Co. has already commenced to put in the piping for an ammonia plant.

——The T. M. Sinclair Packing Co., Cedar Rapids, Iowa, has begun the erection of a building 65×45 feet in size, two stories high, at Des Moines, Iowa, to be fitted up as a cold storage warehouse, and used as a distributing station for its wholesale meat business in the vicinity.

——The Crescent City Slaughterhouse Co. at New Orleans, La., A. B. Wheeler, president, has decided to further enlarge its plant and increase its cold storage facilities at a cost to approximate $40,000. The company has but recently completed improvements representing an outlay of $60,000.

——Swift & Co., packers, have leased Eastman & Co.'s plant at Fifty-ninth street and Eleventh avenue, New York, to be utilized in preparing "Kosher" meat and catering to the Jewish trade of the metropolis. The capacity of the plant is about 7,000 cattle per week, besides sheep and lambs.

——The Kingan Provision Co., of Indianapolis, is improving its meat storage house at Syracuse, N. Y. A building, 50×120 feet in size, three stories and basement, is being fitted up for cold storage purposes. A separate building will be erected to contain the boilers, engine and other machinery. An additional 15-ton De La Vergne refrigerating machine will be put in, and the Westinghouse Co. will put in an electric lighting plant.

——The agencies at Atlanta, Ga., for the big packing houses, Nelson Morris & Co., Cudahy Packing Co., Swift & Co., Hammond & Co., Armour & Co., and Schwartzschild & Sulzberger, have combined, it is stated, for the purpose of building an ice plant which is to be devoted to manufacturing ice for the use of the various storehouses of the companies. Apart from the ice used by the companies, the surplus is to be used to supply the butchers in the city.

——Armour & Co., of Chicago, has been formed into a corporation with a capital stock of $20,000,000. P. D. Armour is president of the corporation, Ogden Armour, vice-president and general manager, C. F. Langdon, secretary. Directors: P. D. Armour, J. Ogden Armour, P. A. Valentine, C. M. Favorite, T. J. Connors, H. P. Darlington and Arthur Meeker. The plants which will be controlled by the corporation are packing houses in Chicago and South Omaha, glue factory, soap factory, hair factory, car shops in Chicago.

ICY ITEMS.

——R. T. Todd has purchased the plant of the Johnson City Ice Co., Johnson City, Tenn., and will operate the same.

——It is reported that the plant of the Crystal Ice Co., at Morristown, Tenn., is to be sold and possibly removed from that city.

——D. Deprez has taken down the machinery of the ice plant at Edinburg, Ind., and shipped the same to Franklin, to be used in the plant being erected there, first mentioned in ICE AND REFRIGERATION for December, 1899.

——The Southampton Ice Co., Southampton, N. Y., is erecting an addition, 30×30 feet in size, so as to increase their storage capacity to 5,000 tons of ice.

——The Austin Ice and Bottling Co. succeeds the Austin City Ice Co. at Austin, Tex., and will enlarge and improve the plant throughout. A bottling establishment will be added.

——The Artesian Ice Co., L. S. Lemaster, proprietor, De Soto, Mo., has purchased the plant and business of the Walthers & Curtis Ice Co., of that city, and will operate the same.

——J. B. Leach has sold his ice manufacturing plant at Wellston, Ohio, to Jasper Corn, the consideration, it is stated, being $18,000. Mr. Corn will improve and operate the plant.

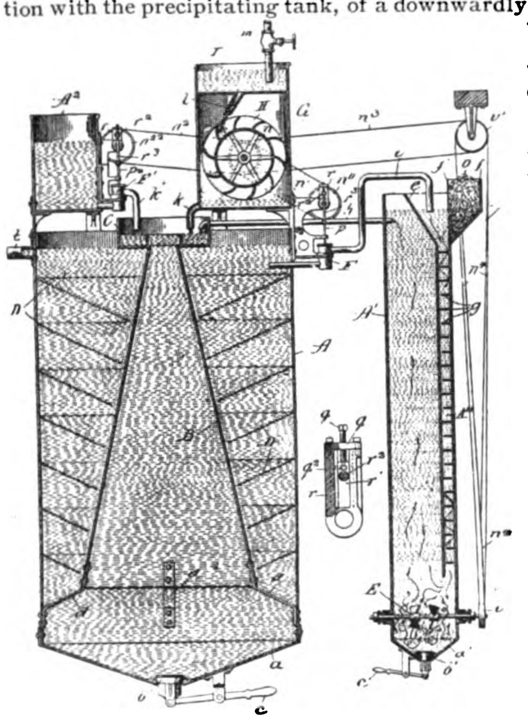
——The Crystal Ice Co., of Davenport, Iowa, are preparing to repair and improve the plant so as to permit of its producing the amount of ice which the machine is capable of freezing. It is proposed to expend about $6,000 on the improvements.

WE append below the most important new patents relating to the ice, ice making, refrigerating, cold storage and kindred trades that have been issued from the patent office during the past month, reported expressly for ICE AND REFRIGERATION. All inquiries relative to patents or trade marks in the United States and foreign countries should be addressed to William S. Beaman, counsellor at law and solicitor of patents, 99 Cedar street, New York city.

APPARATUS FOR PURIFYING WATER.

No 646,108. Cass L. Kennicott, Chicago, Ill., assignor of one-half to C. J. Blair, same place. Filed June 5, 1899. Serial No. 719,439. Patented March 27, 1900. (No model.)

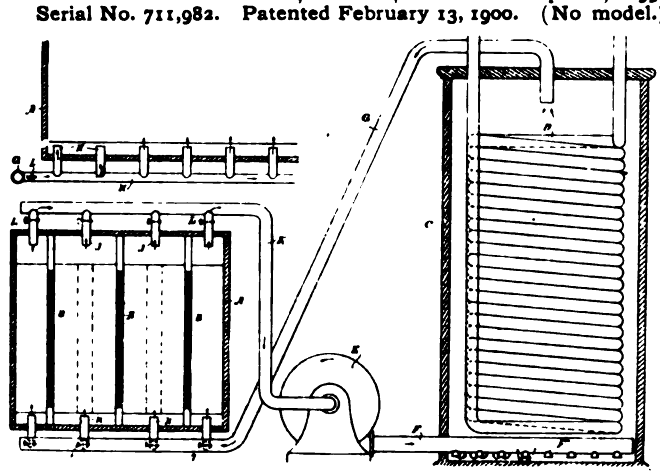
Claim.—1. In a water purifying apparatus, the combination with the precipitating tank, of a downwardly flaring downtake conduit within the tank, said conduit having at its upper end an inlet for the water to be purified and its contained precipitating agent or agents.



2. In a water purifying apparatus, the combination with the precipitating tank, of a downwardly flaring downtake conduit within the tank, said conduit having at its upper end an inlet for the water to be purified and its contained precipitating agent or agents, the area of the base of said conduit being equal or approximately equal to that of the annular space in the tank about said base for the purpose set forth.

PLATE ICE MACHINE.

No. 643,269. John C. Kitton, San Francisco, Cal., assignor of one-half to C. C. Hutchinson, Oakland, Cal. Filed April 6, 1899. Serial No. 711,982. Patented February 13, 1900. (No model.)

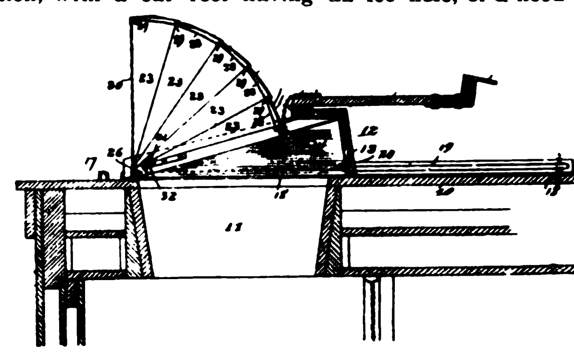


Claim.—1. The combination of a tank adapted to contain fresh water and having freezing plates extending transversely across it, a brine tank having a coil through which is circulated a refrigerating fluid, a rotary blower or pump between the fresh water and brine tanks, having a discharge pipe entering the brine tank and discharging downwardly therein, whereby the air is permitted to rise through the brine, an air conducting pipe connecting the upper portion of the brine tank with the lower portion of the water tank and having independent branches discharging air into the latter at points between adjacent freezing plates, and a return pipe having branches corresponding with the branches of the conducting pipe and connecting the upper portion of the water tank with the blower, whereby the air passing the plates is returned to the blower for re-use in the brine tank.

VENTILATOR FOR REFRIGERATOR CARS.

No. 646,628. Alexander Richmond, Chicago, Ill., assignor to Armour & Co., same place. Filed September 13, 1897. Serial No. 651,497. Patented April 3, 1900. (No model.)

Claim.—1. In a ventilator for refrigerator cars, the combination, with a car roof having an ice hole, of a hood com-

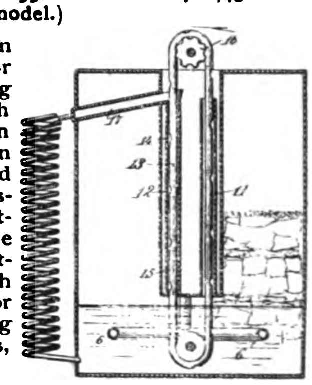


posed of overlapping pivoted sections and a spring for lifting and holding said sectional hood in operative position, substantially as set forth.

REFRIGERATING APPARATUS FOR COLD STORAGE CHAMBERS.

No. 644,965. Charles W. Blagg, Sioux City, Iowa, assignor to himself, Louis Becker, Charles Wise and William Francis Blagg, same place. Filed April 10, 1899. Serial No. 712,438. Pattented March 6, 1900. (No model.)

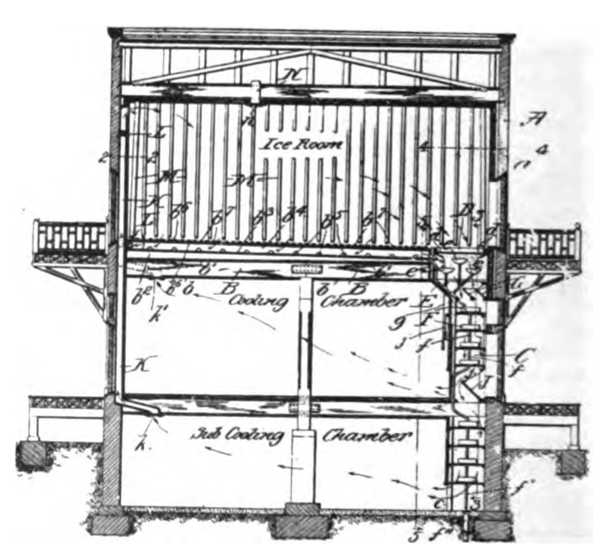
Claim.—1. The combination with a tank constructed for the reception of a refrigerating medium, and provided with two extensions separated by an air space, of a well disposed in the main portion of the tank and communicating with the atmosphere through the top of the latter, air pipes leading from the bottom of the well along the bottom of the extensions through the refrigerant and to the exterior of the tank, and a fan for forcing air through said well and pipes, substantially as described.



COOLER.

No. 642,730. William A. Stickley and John R. Dwyer, St. Louis, Mo. Filed May 22, 1899. Serial No. 717,762. Patented February 6, 1900. (No model.)

Claim.—1. In an apparatus of the character described, the combination with the walls of an ice room, of a floor for said ice room comprising joists B, flooring b^1, inclined strips b^2,



flooring b^3, supporting strips b^4, provided with notches b^5 in their lower edges, a perforated flooring b^6, and slats b^7, arranged on said perforated flooring, substantially as described.

pages, size 5×8½ inches, devoted exclusively to valves, fire hydrants and their accessories, such as flanges, floor stands, gearing, indicators, etc. It includes descriptions, illustrations, price lists and dimension sheets of solid wedge double-face gate valves for every purpose and pressure, and of all sizes from one-quarter inch upward. Valves for different services and pressures are designated by "List Numbers," thus affording a ready means of identifying any particular kind of valve. Of special interest will be found the section giving the makers' detailed recommendation concerning the proper kind of valve to be used for each of the various pipe lines of a number of the more common installations, such as water works systems, steam power plants, artificial and natural gas systems, ammonia ice making and refrigerating plants, etc.

TRADE NOTES.

THE Starr Engineering Co., consulting and supervising engineers and architects, have removed from their quarters at West and Horatio streets, New York city, to 258 Broadway, corner of Warren street, New York.

WANTED AND FOR SALE ADVERTISEMENTS.

[The charge for advertisements in this column is $2 each insertion for seventy words or less, and twenty-five cents for each additional fourteen words. No advertisements will be inserted unless accompanied by the necessary cash. Parties answering these advertisements must write to the addresses given, as the publishers decline to furnish any information concerning them.]

Ice Machine for Sale.

FOR SALE.—Machinery for 5-ton ice factory; has 10-ton compressors, two boilers, etc. L. KAMP, Mt. Carmel, Ill.

Ice Machine for Sale.

FOR SALE.—A 12-ton Linde refrigerating machine, brine system, good order, but little used; at a bargain. Address H. A. BUSH, Erie, Pa.

Engineers Wanted.

WANTED.—Two absorption ice machine engineers; must be thoroughly competent and give good references. Address PACIFIC COLD STORAGE CO., Tacoma, Wash.

Position as Engineer.

Experienced absorption ice machine engineer and machinist open for engagement. Address, stating wages, etc., "WRIGHT," 208 Wilkerson street, Montgomery, Ala.

Refrigerating Machine for Sale.

Six-ton refrigerating compression machine, American Ice Machine Co.'s make, in actual use only three years. Has atmospheric condensers, number 1 condition. Twelve hundred dollars cash if taken at once. Address ERNEST HOFFMAN, Lexington, Mo.

Situation Wanted.

WANTED.—Situation for 1900 by first-class compression ice engineer; 25 years' experience; can go any place on short notice; large plant preferred; will take stock or interest in good plant for half of salary. Address "COMPRESSION 25," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Position as Engineer.

WANTED.—Position as refrigerating engineer in ice plant, packing house or brewery. Understands can system; compression plant of 100 to 200 tons preferred. Can make all repairs; have city license; have passed civil service examination for engineer; good reference. Address "I. O. U.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago, Ill.

Position as Engineer.

WANTED.—Position by a first-class and thoroughly competent steam and ice machine engineer, who has had several years' practical experience, and who can give A No. 1 references from former employers. Correspondence respectfully solicited from any one needing such a man. Address "ENGINEER No. 1," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

For Sale.

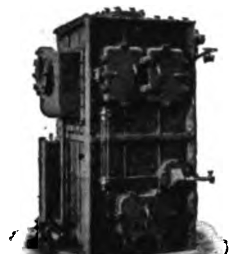
$200 steel cylinders, about twelve feet long, twenty-four inches diameter, 1¼-inch heads, ¼-inch sides, only $70 each. All been tested to 1,500 pounds to inch pressure. Extra heavy 2-inch pipe 11 feet long, in coils, 20 cents per foot. In very best condition, and well adapted for steam or refrigeration. Also 1¼-inch, 1-inch, 2-inch and 3-inch pipe, assorted, at low prices; ice cans, 100, 150, 200, 250 pounds capacity. F. O. B. here. L. B. HASKELL, Gloucester, Mass.

Compend of
Mechanical
Refrigeration

Retsof Brine Salt


STURTEVANT
GENERATING SETS

COCHRANE
FEED-WATER HEATERS AND PURIFIERS.



In every steam plant an exhaust steam feed-water heater will effect a saving of from 5 per cent to over 20 per cent, according to the conditions, whether the plant is operated high pressure, exhausting free to the atmosphere; whether operating under back pressure, using the waste steam for heating or drying, or whether it is operated condensing, even though these plants are equipped with economizers and provided with live steam purifiers. And while making this saving, the exhaust steam feed-water heater will eliminate the strains caused by introducing cold water into economizers, live steam purifiers and boilers, which strains are chiefly recognizable in repair bills and stoppages.

THE EFFECT ON A PLANT OF A GOOD FEED WATER HEATER—A COCHRANE—THAT WILL DELIVER WATER CLOSE TO 212° CAN BE QUICKLY FIGURED IN THIS WAY: FOR EVERY 10° THAT THE TEMPERATURE OF THE WATER BEING DELIVERED TO YOUR BOILERS IS UNDER 212° OVER 1 PER CENT OF THE TOTAL FUEL BILL CAN BE SAVED, IF THERE IS EXHAUST STEAM AVAILABLE TO DO THIS HEATING.

HARRISON SAFETY BOILER WORKS, : : : : : : Philadelphia, Pa.

Manufacturers COCHRANE SEPARATORS.

EPHRAIM BANNING
THOS. A. BANNING.

Eastern Correspondent,
HUBERT A. BANNING,
140 Nassau St., New York

BANNING & BANNING

MARQUETTE BLDG., CHICAGO.

MAKE A SPECIALTY OF

REFRIGERATION PATENTS AND LITIGATION.

Formerly Attorneys for DE LA VERGNE REFRIGERATING MACHINE CO.

PATENT AND TRADE MARK LAW. CORRESPONDENCE INVITED

PERFORATED METAL
FOR ICE MACHINES

We manufacture more Perforated Metal for Ice Machines than any firm in America. . . . Established in 1869

THE ROBERT AITCHISON PERFORATED METAL CO.
303 to 305 Dearborn Street
Chicago, Illinois, U. S. A. . . .

Bachmans' Ideal System of Water Purification

Removes all oil, scale forming and corroding matter from water before it enters the boiler, rendering it equal to rain water.	TRADE IDEAL MARK	GUARANTEED TO ABSOLUTELY PREVENT SCALE and CORROSION

THE IDEAL MANUFACTURING COMPANY : : : ELLICOTT SQUARE, BUFFALO, N. Y.

Practical Ice Making and Refrigerating

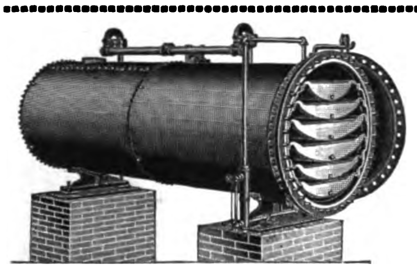
is a practical, common sense treatise on the construction and operation of Ice Making and Refrigerating Machinery and Apparatus.

PRICE, Bound in Cloth, - - - - $1.50
Bound in Morocco, - - - - 2.00

By EUGENE T. SKINKLE

H. S. RICH & CO., Publishers,

208 BROADWAY, NEW YORK — 177 LA SALLE ST. CHICAGO



LIVE STEAM PURIFIER.

Eastern Office, 701½ Girard Bldg., Philadelphia.

FOREIGN OFFICES:
3½ Victoria St., Westminster, London, S. W., Eng.
60 Boulevard Haussmann, - Paris, France.

THE HOPPES LIVE STEAM FEED WATER

PURIFIER

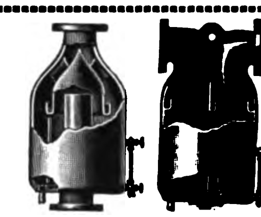
AND EXHAUST STEAM FEED WATER

HEATER

Make the most efficient plant that can be installed for heating and purifying your boiler water. Clean boilers guaranteed.

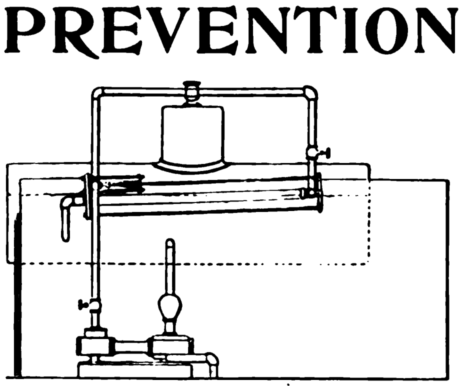
THE HOPPES MANUFACTURING CO.

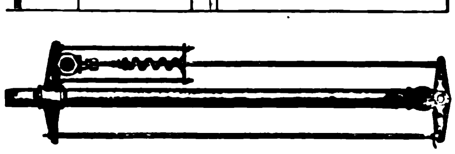
21 James Street, SPRINGFIELD, OHIO.



HOPPES STEAM SEPARATORS AND OIL ELIMINATORS Are Largest and Most Effective.

PREVENTION OF BOILER EXPLOSIONS





ADVANTAGES OF THE FEED WATER REGULATOR.

1st. It saves one hundred per cent of boiler explosions. Why?
ANSWER. When the water in the boiler drops one-half inch, the valve pipe expands and increases the speed of the pump, keeping the water at its normal condition, and in connection it has a low water alarm which gives alarm when the feed pump gets out of order.
2d. It saves twelve per cent of fuel. Why?
ANSWER. By keeping the water in the boiler at its normal condition saves the unnecessary boiling of a large body of water that accumulates without a regulator at times.
3d. It saves fifty per cent in repairs on boilers. Why?
ANSWER. By keeping the water at the normal condition it prevents flues from expanding and contracting, which causes them to leak.
4th. It saves twenty-five per cent on the engines and pump. Why?
ANSWER. The regulator prevents water from going over to the cylinder.
5th. It saves twelve per cent of water. Why?
ANSWER. As the feed water is regulated by the amount of steam used.
6th. It saves a great loss of life and property that cannot be estimated. Why?
ANSWER. Because the water in the boiler is always kept above the danger line by expansion and contraction, which never fails to act.
7th. It is perfectly safe and reliable, owing to its simplicity and durability, as the expansion pipe is made of extra heavy copper.
8th. It works by natural cause, which is expansion and contraction, caused by the rising and lowering of water in the boiler.
9th. It reduces insurance rates.
The above statement is fully guaranteed by the Boiler Feed Water Regulator Co., and we will be pleased to ship to any responsible party one of our machines on thirty days' trial, charges prepaid, and if our machines do not give satisfaction, the same can be returned at our expense.

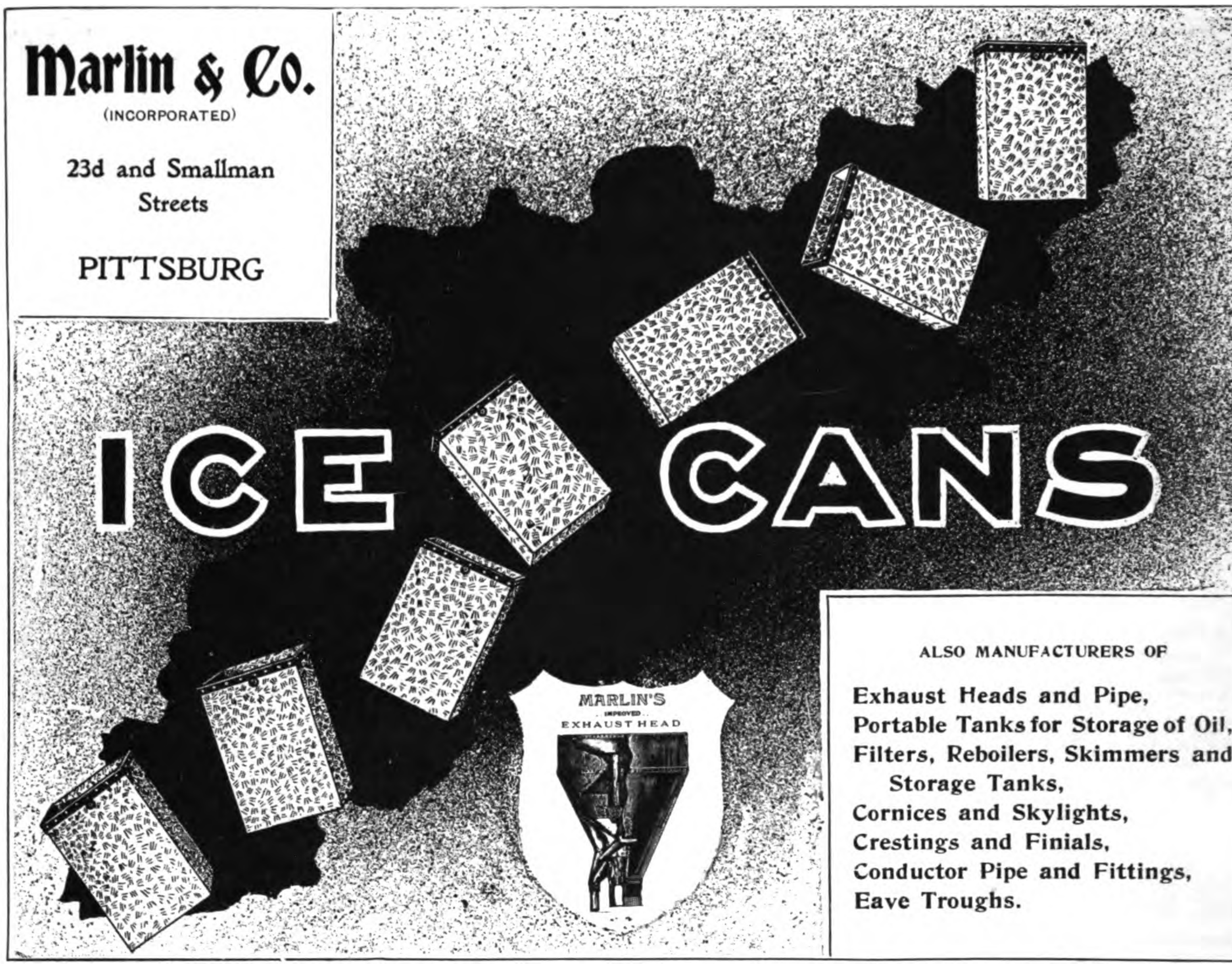
Patent applied for. **STANDARD ICE MACHINE CO., Cor. 6th and Rigdon Sts., Hamilton, Ohio.**

Marlin & Co.

(INCORPORATED)

23d and Smallman Streets

PITTSBURG



ALSO MANUFACTURERS OF

Exhaust Heads and Pipe,
Portable Tanks for Storage of Oil,
Filters, Reboilers, Skimmers and Storage Tanks,
Cornices and Skylights,
Crestings and Finials,
Conductor Pipe and Fittings,
Eave Troughs.

Baldwinsville Centrifugal Pump Works

CENTRIFUGAL, TRIPLEX AND DEEP WELL POWER PUMPS

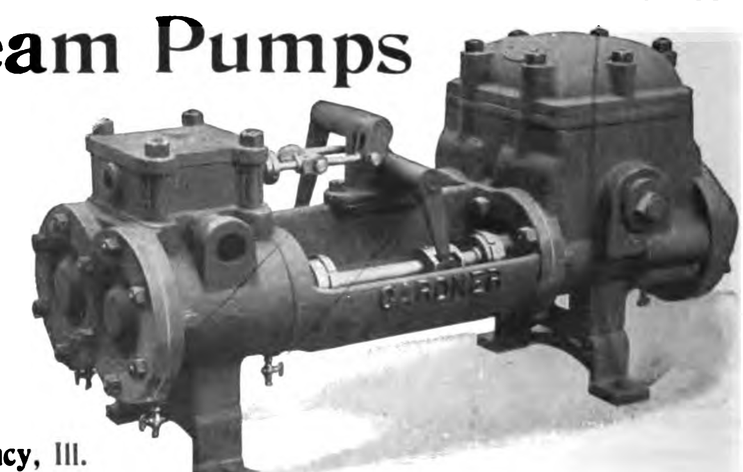
For ICE AND REFRIGERATING PLANTS,
BREWERIES, DISTILLERIES,
CONTRACTORS' USE, Etc.

SEND FOR CATALOGUE.

IRVIN VAN WIE, Proprietor,

723 West Fayette St., SYRACUSE, N. Y.

Use Gardner Steam Pumps



In your ice plants. They will give you better service and last longer than other makes. Are not constantly requiring repairs. Made well and strictly "up-to-date" in all details. They will probably cost you a little more at installation, but the additional price is more than compensated for by the superior quality and the genuine satisfaction derived from their use. If you are in the market, write us. Catalogue XX on request.

The Gardner Governor Co., Quincy, Ill.

Galvanized Steel ICE CANS

OVER 150,000

OF OUR

Cans in Use and Distributed in 33 States and Foreign Countries,

AS FOLLOWS:

ALABAMA
ARIZONA
COLORADO
CONNECTICUT
DIST. OF COLUMBIA
FLORIDA
GEORGIA
ILLINOIS
INDIANA
KANSAS
KENTUCKY
LOUISIANA
MARYLAND
MISSISSIPPI
MISSOURI
NEW JERSEY
NEW MEXICO
NEW YORK
NEBRASKA
NORTH CAROLINA
OHIO
OKLAHOMA TER.
PENNSYLVANIA
SOUTH CAROLINA
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TEXAS
VIRGINIA
WEST VIRGINIA
WISCONSIN
SOUTH AMERICA
BRITISH COLUMBIA
WEST INDIES
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MANUFACTURERS OF

TANKS,
RE-BOILERS,
FILTERS,
SKIMMERS,
DISTRIBUTING
TROUGHS, ETC.

Either of Black Steel or Galvanized Iron,

FOR ICE MAKING AND REFRIGERATING PLANTS.

ESTABLISHED 1861. CAPACITY, 300 PER DAY. INCORPORATED 1890.

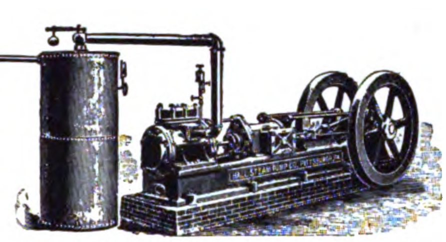
CHRIS. KIECHLER, Sr., President.

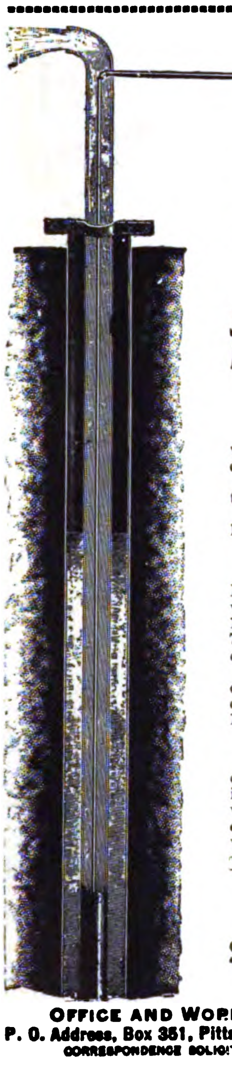
The Kiechler Manufacturing Company

POWER SHEET METAL WORKS

WRITE FOR PRICES

CINCINNATI, OHIO, U. S. A.





THE HALL STEAM PUMP CO.'S

Air Lift Well Pump

BEST SYSTEM FOR PUMPING WATER FROM ARTESIAN OR OTHER WELLS.

Special Advantages: This system dispenses with working barrels, valves, sucker rods and leather cups, which require constant attention and repair. NO MOVING PARTS used in the well, consequently there is no wear.

A largely INCREASED output of water, with a largely DECREASED expenditure of power.

No freezing of pipes possible.

OUTPUT FROM ARTESIAN WELLS

Pumped by this system will average from 6-inch wells, 75 to 100 gallons per minute; 8-inch wells, 150 to 500 gallons per minute; 10-inch wells, 300 to 750 gallons per minute, depending only on the productiveness of the well.

Should one well not produce sufficient water, the compressed air from a single compressor may be divided among a number of wells located apart, lifting from each well all the water it can produce.

Write for estimate and give the following information:

1—Depth of well. 2—Diameter of well. 3—Depth of water level below the surface when not pumping. 4—Depth of water level below the surface when well is pumped at full capacity. 5—Estimated capacity of well. 6—Elevation above surface to which the water is to be raised.

Plants Erected on a Full Guarantee of Efficient Working.

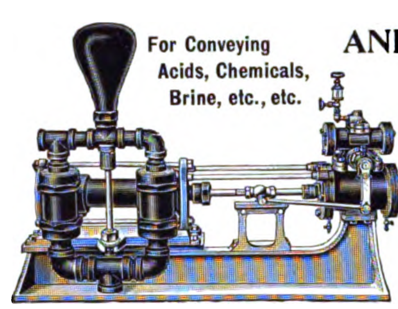
HALL STEAM PUMP CO.

MANUFACTURERS OF

Steam Pumps, Single or Duplex, and Air Compressors.

OFFICE AND WORKS, GRANT AVE., NEAR UNION BRIDGE,
P. O. Address, Box 351, Pittsburgh, Pa. ALLEGHENY, PA.
CORRESPONDENCE SOLICITED.

ACID PUMPS AND FITTINGS



For Conveying Acids, Chemicals, Brine, etc., etc.

Made of

HARD RUBBER

American Hard Rubber Co., New York.

A. D. COOK

MANUFACTURER OF IMPROVED . . .

Tube Well Supplies

COOK'S PATENT

TUBE WELL STRAINERS AND STEAM PUMPS . .

A SPECIALTY.

LAWRENCEBURG, IND.

WINDLE'S PATENT IMPROVED GALVANIZED STEEL

ICE CANS

IRON-CLAD GUARANTEE { If they leak within five (5) years, in ordinary use, I agree to repair or replace them free of charge....

I HAVE GOT THE GOODS AND AM NOT AFRAID TO BACK THEM.

PEOPLE GUARANTEE OTHER THINGS, WHY NOT ICE CANS?

TRY to get such a guarantee from any other reliable firm in the United States. They dare not give it. I dare not give it on the ordinary can. Always ask for and demand the guarantee in buying cans, and be convinced.

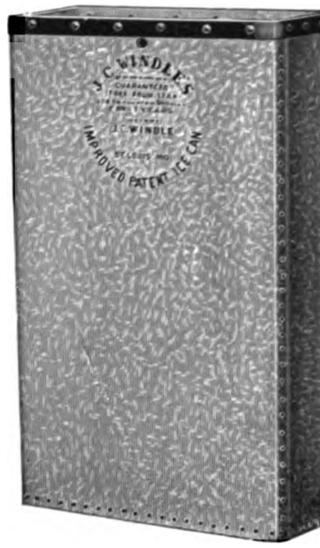
I make the ordinary can, too, and, like all other firms, do guarantee it tight when delivered only.

What Some of the Managers of Leading Ice Plants Say:

We have 1,700 of your 300-pound Windle Patent Ice Cans in use for the past two seasons, and are perfectly satisfied with them. EAST ST. LOUIS ICE AND COLD STOR. CO., East St. Louis, Ill., W. S. ASHTON, Manager.

We have over 3,000 ordinary ice cans in use. They have always leaked and caused us loss in salty blocks. We have tried many tinners, and paid large sums of money to have them resoldered, and they still leaked, getting worse all the time, until three years ago, when we had new "Windle Patent" bottoms put in them. We have had no leaks or salty cakes since. We can highly recommend the "Windle Ice Can," manufactured by J. C. Windle, as the only one we have ever seen which will not leak. We have found his guarantee with us as good as gold

GRIESEDIECK ARTIFICIAL ICE CO., ROBT. BAUER, Secretary.



CAPACITY, 200 PER DAY.
Patent No. 572,234.
Any Size, Weight or Style.

Repair and Rebottoming Department.

To the Manufacturers of Artificial Ice Any Place in the United States:

DO YOUR ICE CANS LEAK?

Are they a continual source of annoyance and expense? Are you troubled with salty blocks? Have you paid out money to have them soldered over and over? Do they still leak? Have you come to the conclusion that they cannot be made tight?

I CAN GET YOU OUT OF TROUBLE.

It costs you nothing to prove it to your entire satisfaction. Send me one of your old cans by freight, no matter how rusty it looks or how long it has leaked, or who has tried to fix it. I will put a **new Windle Patent bottom** in that can and return it to you free of charge. All you pay is the freight both ways (which is trifling). After receiving and using this can, if you should desire to have all or any part of your cans rebottomed, write for price, stating how many. If not, just **keep your eye on that can for the next five years.** That is all the pay I want. It sells my cans and gets me work. If you do not need me now, you will later on. I ship the bottoms to your plant, **no matter where you are located,** and send men to put them in. I have men constantly on the road putting in bottoms, and handle so many that I have got the cost down to a minimum. Send on your old cans and see something that will surprise you.

FILTERS, REBOILERS, BRINE PIPES, TANKS, and all SHEET IRON WORK required in the construction of Ice Plants, Breweries, Cold Storages, etc. Write for prices.

J. C. WINDLE, 2701 North Ninth Street, St. Louis, Mo.

John Turl's Sons

534 and 536 W. 28th St., New York

MANUFACTURERS OF

ICE CANS of any desired pattern.....

Built of Best Steel or Iron.

Brine Tanks Smoke Stacks and Iron Tanks.

Estimates Cheerfully Furnished.

Sheet Iron Work of all kinds for Ice Factories, Cold Storage and Breweries

The **"Warwick"** PATENTED is the ONLY **Can Filler**

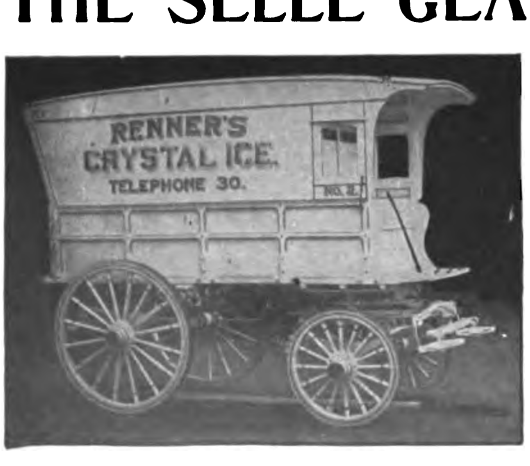
That both starts and stops the flow of water AUTOMATICALLY by the simple action of placing it in the can.

WHY ICE MANUFACTURERS USE THEM.

First.—It has no exposed working parts, and therefore cannot be injured by rough usage on the tank.
Second.—It is the **only** Can Filler that **starts** itself, and is therefore the only genuine automatic.
Third.—It never forgets to "start" the flow of water when placed in the can.
Fourth.—It never forgets to stop the flow of water, and thus prevents overflowing of cans, with consequent loss of distilled water and weakening of the brine.
Fifth.—It insures that every cake of ice shall be of uniform size and weight.
Sixth. It admits of the cans being properly filled, with the least help and minimum amount of attention.

WARWICK MACHINE CO., Newport News, Va.

THE SELLE GEAR CO. AKRON, OHIO



SOLE MANUFACTURERS OF

SELLE'S PATENT TRUSSED

ICE WAGON,
BREWERY WAGON,
PLATFORM WAGON,

Truck and Omnibus Gears, also Half Platform **and Three-Spring Wagon** Gears.

For sale by all Dealers in Wagon Makers' Supplies.

We are prepared to supply complete

Ice Wagons

of best construction at reasonable rates.

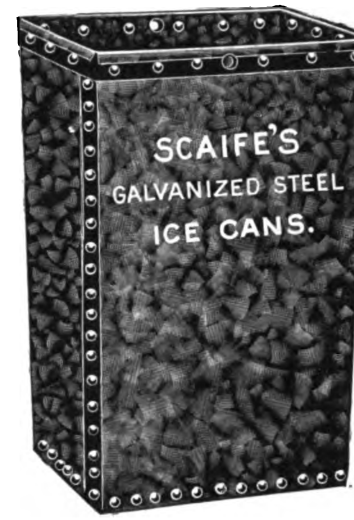
SELLE'S GIANT TRUCK GEAR, BOTTOM VIEW.

WM. B. SCAIFE & SONS

MANUFACTURERS OF

Ice Cans

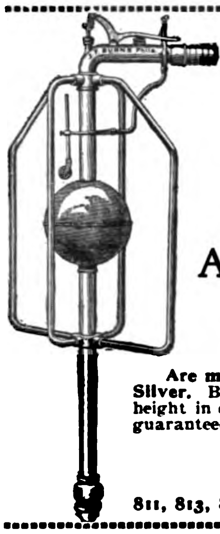
WE have the largest and best equipped factory in this country for the production of Galvanized Iron Work. Guarantee absolute satisfaction, prompt delivery and moderate prices . . .



ALSO MANUFACTURERS OF **STRUCTURAL IRON WORK**
CORRUGATED IRON, BRINE TANKS

And all Sheet Iron Work required in the construction of Ice Factories, Breweries, Cold Storages, etc.

Offices, 221 First Avenue, PITTSBURGH, PA.



Where Burns Fillers are in Use, the "Salt Man" Traveleth Not! (No Biz.)

BURNS
AUTOMATIC ICE CAN FILLERS

ARE LIGHT, ACCURATE, STRONG.

Are made entirely of Brass, Bronze, Copper and German Silver. Burns Can Fillers will put the water up to the proper height in every can, every time, keep on doing it, and are so guaranteed. Correspondence solicited.

JAS. F. BURNS
(Can Filler Maker to the Ice Baron)
811, 813, 815 Fairmount Ave. PHILADELPHIA.

CYLINDER SCALE CO.

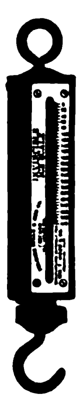
SOLE MANUFACTURERS OF

THE PEERLESS ICE BALANCE

150, 200, 300 and 400 pounds capacity.

OFFICE AND WORKS:
MILLVILLE, MASS.

SEND FOR PRICES. CORRESPONDENCE SOLICITED.



WOOD'S ICE TOOLS

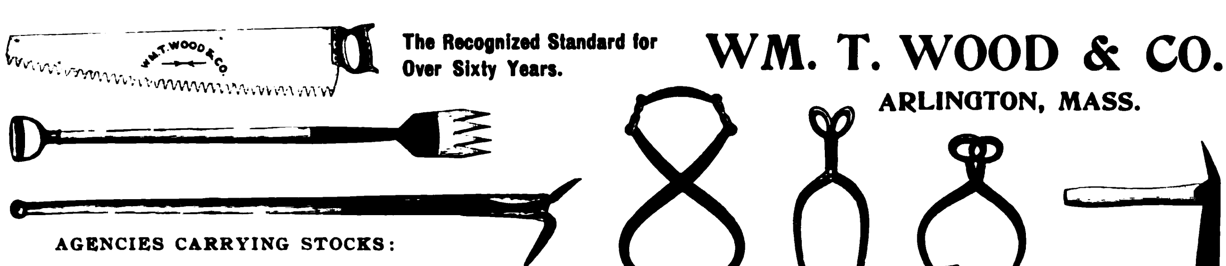
FINEST QUALITY

FOR ICE FACTORIES AND DELIVERY WAGONS

The Recognized Standard for Over Sixty Years.

WM. T. WOOD & CO.

ARLINGTON, MASS.



AGENCIES CARRYING STOCKS:
EDWIN HUNT'S SONS, 180 Lake St., Chicago, Ill.
THE FRED W. WOLF CO., 40 W. Alabama St., Atlanta, Ga., E. E. EAGAN, MANAGER.

Send for Illustrated Catalogue.

THE PREMIUM
HAY-STOCK GRAIN & COAL WAGON SCALE
OF THE WORLD
LISTS FREE

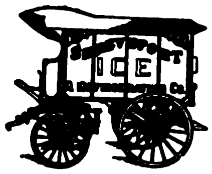
OFFICIAL STOCK SCALE
WORLDS FAIR, CHICAGO. 1893
ALSO OMAHA EXPOSITION 1898
AWARDED DIPLOMA & GOLD MEDAL.
GET THE BEST AND SAVE MONEY
THOUSANDS OF SPECIALTIES

ADDRESS
CHICAGO SCALE CO
292, 294 & 296 JACKSON BOULEVARD CHICAGO, ILL.

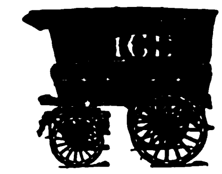
BREWERS and ICE CAN
NUBIAN

For Brine Pipes, Coils, Condensers, Ice Cans, and all work around the Ice Factory or Cold Storage Room. Stops small leaks in Ice Cans, and prevents rust

NUBIAN PAINT AND VARNISH CO.
900 Fifty-first Avenue, CHICAGO, ILL.



WHY BUY NEW WAGONS EVERY YEAR



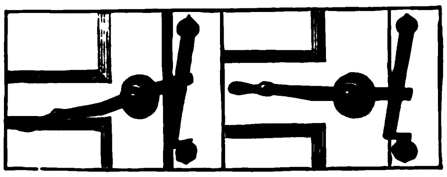
OR TWO WHEN YOU CAN GET THEM THAT RUN SIX YEARS AND LONGER? WE MAKE THEM, AND A SAMPLE ORDER WILL CONVINCE YOU, AS WE HAVE OTHERS.

WRITE FOR CUTS AND PRICES. KOENIG & LUHRS WAGON CO., Quincy, Ill.

Gloekler's Improved Refrigerator Door Fastener

PATENTED JANUARY 20, 1891.

THE BEST ON THE MARKET.



GIVES SATISFACTION EVERYWHERE.

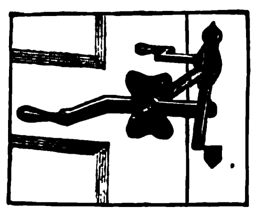
ONCE TRIED, ALWAYS USED.

By reversing the lever the door can be forced open, as shown in the left illustration. **They can be used right or left.** Made in five sizes to suit large or small doors. Malleable iron and well tinned. They are very strong and durable, are placed flush on the surface of door, thus easily applied. Can also be had in nickel-plated and polished brass.

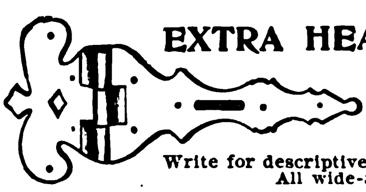
There are two sizes which operate on inside of door also.

No. 0. For doors 10 in. thick and less, 16-in. lever, including handle.

No. 00. For doors 6 in. thick and less, 13-in. lever, including handle.



For Cold Storage Houses they have no equal.



EXTRA HEAVY HINGES...

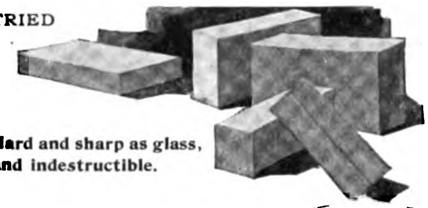
FOR COLD STORAGE ....WAREHOUSES.

Write for descriptive Price List.
All wide-awake dealers sell them.

BERNARD GLOEKLER, Pittsburg, Pa.

HAVE YOU EVER TRIED

CRUSHED QUARTZ FOR YOUR FILTERS



Hard and sharp as glass, and indestructible.

Fire Brick, Portland Cement, etc.

GARDEN CITY SAND CO., Security Bldg., Chicago

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD, CONN.

ORGANIZED 1866 — ORGANIZED 1866

THOROUGH INSPECTIONS

—AND—

Insurance against Loss or Damage to Property and Loss of Life and Injury to Persons caused by

STEAM BOILER EXPLOSIONS

J. M. ALLEN, President.
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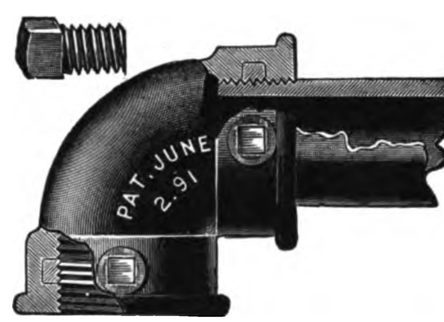
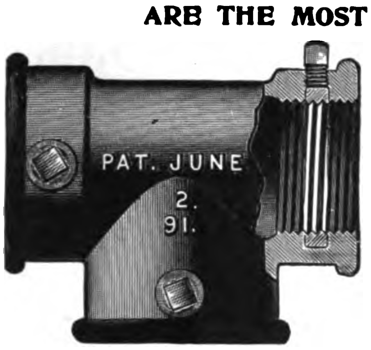
TIGHT JOINT Ammonia Fittings and Flange Unions



ARE THE MOST RELIABLE IN THE MARKET.



These Fittings have proved themselves in the past five years the most **economical** for Ice Machine Piping, and the only ones that insure **NO** leakage of Ammonia or Brine.

We carry a stock of over 60,000 Fittings and Flange Unions, which insures prompt filling of orders.

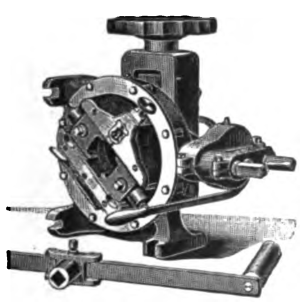
We manufacture ELBOWS, TEES, COUPLINGS, RETURN BENDS, RIGHT and LEFT, and REDUCING FITTINGS, BUSHINGS and FLANGE UNIONS.

More than 500 Plants in the United States are equipped with "Tight Joint" Fittings and Flanges.

TIGHT JOINT CO., 159 Bank Street, NEW YORK CITY.

Armstrong's Pipe Threading and Cutting off Machines

HAND OR POWER
SIZES, 1-8 TO 6 INCHES



New No. 0 Threading Machine.

CUTTING ATTACHMENT ON ALL MACHINES FROM 1 TO 6 INCHES INCLUSIVE

Our No. 0 machine is designed for threading the smaller sizes of pipe—iron or brass—also bolts. Works with great ease and rapidity. Has two speeds, one for pipe ⅛ to 1 inch, the other for pipe 1¼ to 2 inches, inclusive. You change crank from one speed to the other as wanted, and so get rid of turning a great number of times on small pipe.

ARMSTRONG'S ADJUSTABLE STOCKS AND DIES. WATER, GAS AND STEAM FITTERS' TOOLS

THE ARMSTRONG MANFG. CO., 139 CENTRE ST., NEW YORK
BRIDGEPORT, CONN.

Wheeler Condenser and Engineering Company

MAIN OFFICE, 120 LIBERTY STREET, NEW YORK.
CHICAGO, 1642 MONADNOCK BLOCK.

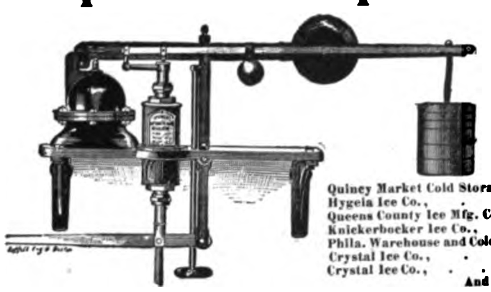
Barnard Water-Cooling Tower

For Ammonia and Steam Condenser Service.

WHEELER SURFACE CONDENSERS. **WHEELER FEED WATER HEATERS.**

SEND FOR CATALOGUES.

The Spencer Damper Regulator



Makes a partial stroke in both directions.
Moving damper by correct principles.

REFER TO THE FOLLOWING USERS:

Quincy Market Cold Storage Co., . Boston, Mass.
Hygeia Ice Co., . . . New Haven, Conn.
Queens County Ice Mfg. Co., Far Rockaway, N. Y.
Knickerbocker Ice Co., . . . Camden, N. J.
Phila. Warehouse and Cold Stor. Co., Philadelphia, Pa.
Crystal Ice Co., ... Richmond, Va.
Crystal Ice Co., ... Petersburg, Va.
And others.

THE CRYSTAL ICE CO., RICHMOND, VA.
The Spencer Damper Regulator has given perfect satisfaction, exceeding your guarantee in the amount of fuel saved. We have saved money by its use.
C. D. WINGFIELD, *Treasurer.*

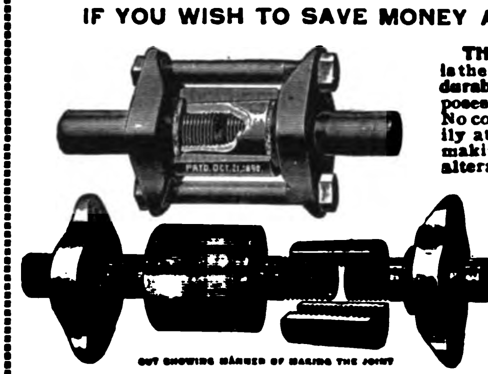
Sent on trial. Write for circulars and prices.

A. CARMICHAEL, SPECIAL AGENT, P. O. Box 717, Westerly, R. I.

G. G. STILLMAN, Mfrs. Sole Agent, 19½ Pearl St., BOSTON, MASS.

Use the CLIMAX COUPLING

IF YOU WISH TO SAVE MONEY AND LABOR.



THE CLIMAX COUPLING is the cheapest, best and most durable joint for all purposes, especially ammonia. No coupling can be so speedily attached or detached, making it invaluable for alterations and repairs.

Write for further Information, Testimonials and Prices.

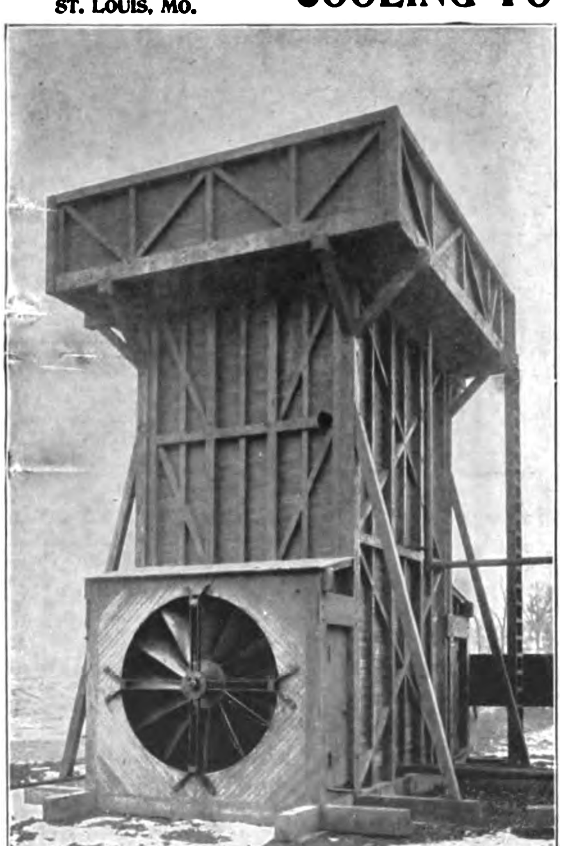
Enoch Lawson
6956 Kinney Avenue,
Park Side, CHICAGO

GEO. J. STOCKER,
2831 Victor Street,
ST. LOUIS, MO.

MANUFACTURER OF

COOLING TOWERS

PATENT JOHN STOCKER



Apparatus for the Re-Cooling of Ammonia and Steam Condenser Water.

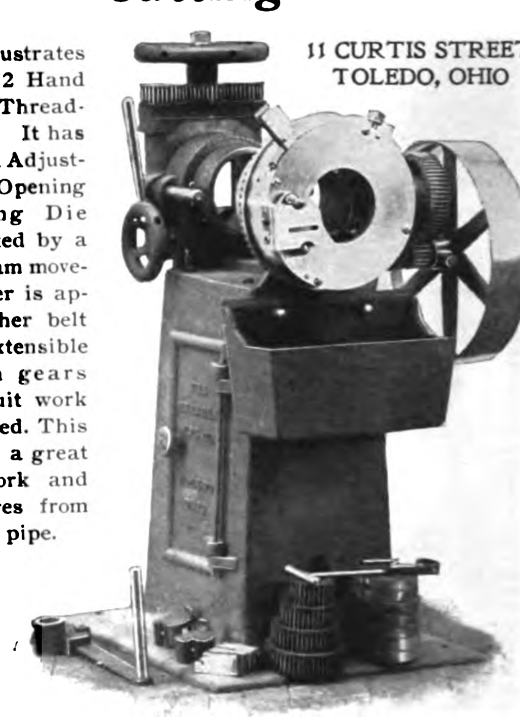
SAVES FROM 90 to 95 PER CENT of the Water Required for Condensing and Cooling Purposes.

Owing to the superior construction of the cooling surfaces (about 40 per cent larger than with the Gradirworks, patent Klein) and the most perfect methods of distributing the water, the efficiency of this Cooling Tower is greater than with any other in the market, and the temperatures obtained considerably lower. References from leading firms all over the United States. Information and estimates, etc., cheerfully furnished.

MERRELL MFG. CO.

Manufacturers of **Pipe Threading and Cutting Machines**

11 CURTIS STREET
TOLEDO, OHIO



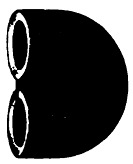
THIS cut illustrates our No. 2 Hand Power Pipe Threading Machine. It has our Standard Adjustable Quick Opening and Closing Die Head, actuated by a convenient cam movement. Power is applied by either belt wheel or extensible crank, with gears graded to suit work to be performed. This machine has a great range of work and quick changes from size to size of pipe.

For full particulars, send for handsomely illustrated Catalogue.

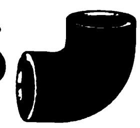
SEE CHANGE OF COPY AND CUT IN THIS SPACE NEXT ISSUE

STEEL FITTINGS

FOR



ICE MACHINES

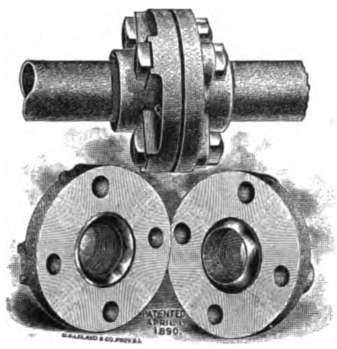


MANUFACTURED BY

STANLEY G. FLAGG & CO.

220 Broadway, NEW YORK. 19th St. and Penna Ave. PHILADELPHIA.

Dart Patent Peerless Flange Union



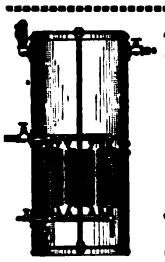
No Packing required.
Ground Bronze Seats.
Perfect Alignment of Pipes not necessary.

POINTS

Adapted for High Pressure.
Absolutely Tight Joints assured.
Section of Piping easily removed.
No old Packing to scrape from Flanges.
Thousands in use working finely.

Write for Prices and Discounts. Manufactured by

E. M. DART MFG. CO., Providence, R. I.



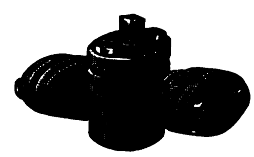
THE BEST AND MOST EFFICIENT

EVAPORATOR

SINGLE, DOUBLE AND TRIPLE EFFECT.
For making pure water out of salt or other impregnated water
FOR ICE MAKING PLANTS.

JAMES REILLY REPAIR AND SUPPLY CO
229-230 WEST ST., NEW YORK.
ESTABLISHED 1867. INCORPORATED 1892

AMMONIA COCKS, GATES, ETC.



WHY NOT BUY THE BEST

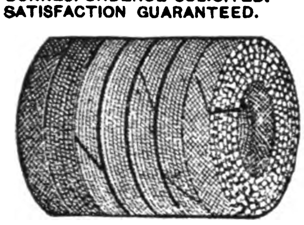
Vulcanized-Asbestos Packed Iron Cocks with Gland Ends for Ammonia.

These are the Only Reliable Ammonia Valves on the Market.

Also Asbestos Discs, Valves of all kinds for Steam.

WESTERN VALVE CO., 43 W. Randolph Street, Chicago

CORRESPONDENCE SOLICITED.
SATISFACTION GUARANTEED.



MONITOR RING PACKING

R. D. LANE & CO.

(Formerly with Garlock Packing Co.)

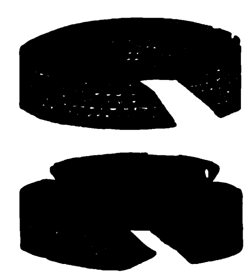
MANUFACTURERS OF

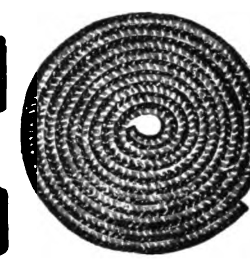
Special Packings

For Steam, Water, Ammonia, Gas.

Phila. Branch: 104 N. FIFTH ST.

Main Office and Factory: 83 CENTRE ST., NEW YORK.



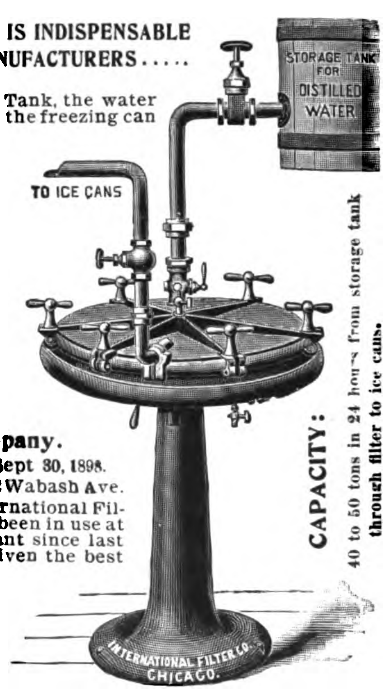


WATERPROOF SPECIAL

CLEAR ICE

AND How to Obtain it

THE INTERNATIONAL FILTER IS INDISPENSABLE TO THE UP-TO-DATE ICE MANUFACTURERS.....



Connected with the Storage Tank, the water passing through the Filter into the freezing can is freed from all dust, rust, oil, etc. No device you may now be using for this purpose can take the place of our filter, whose object is to remove all foreign matter, which previously there was no way of arresting.

Easy to apply to any plant.
Simple to operate.
Requires little attention.
Occupies small space.

Also specially adapted for filtering distilled water for bottling purposes, insuring a perfectly brilliant water.

The Consumers Company.

CHICAGO, ILL., Sept 30, 1898.

INTERNATIONAL FILTER CO., 1702 Wabash Ave.

Gentlemen:—The eight International Filters we purchased of you have been in use at our Ice and Cold Storage Plant since last March, and at all times have given the best of satisfaction.

Before using your filters we had some difficulty in keeping our ice clean and free from dust and specks; but since we have adopted your machines in connection with our charcoal filters, etc., have had no trouble, our ice at all times showing up clean and free from any discoloration.

Yours truly, (Signed) O. B. FAIR,
Mechanical Supt. The Consumers Company

Send for Circular and Prices.

International Filter Co.

1702 Wabash Avenue, CHICAGO, ILL.

PERHAPS YOU BUILD : : : :

ICE MACHINES
CONDENSERS
COMPRESSORS or
STEAM ENGINES

WE MANUFACTURE

Oiling Devices and Oil Cups

FOR SERVICE ON SUCH MACHINES

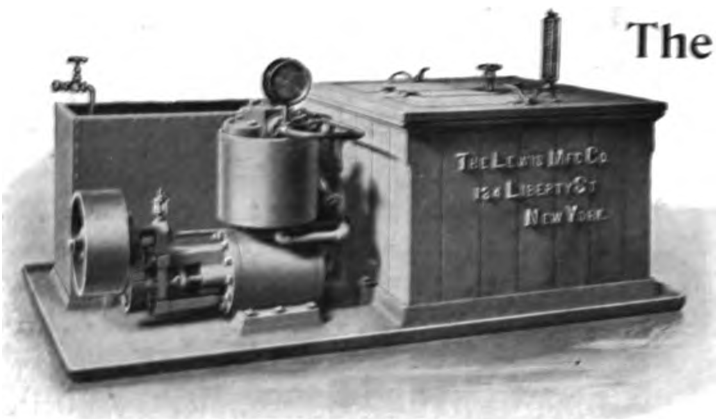
WHY CAN'T WE SELL YOU?

WE SHALL BE GLAD TO SEND SAMPLES AND QUOTE PRICES

WE BEAR ALL THE EXPENSE OF TRIAL ORDERS

WM. H. WILKINSON & CO.

352 ATLANTIC AVENUE, BOSTON, MASS.



The Portable Ice Machine

Makes 500 to 600 pounds of Ice in 24 hours with $1\frac{1}{2}$ horse power. Requires no engineer. Is shipped all set up, ready to operate, except power.

For Catalogue, address... Price, $450.00.

THE LEWIS MFG. CO.

Sole Proprietors and Manufacturers.

26 Cortlandt St., New York, U. S. A.

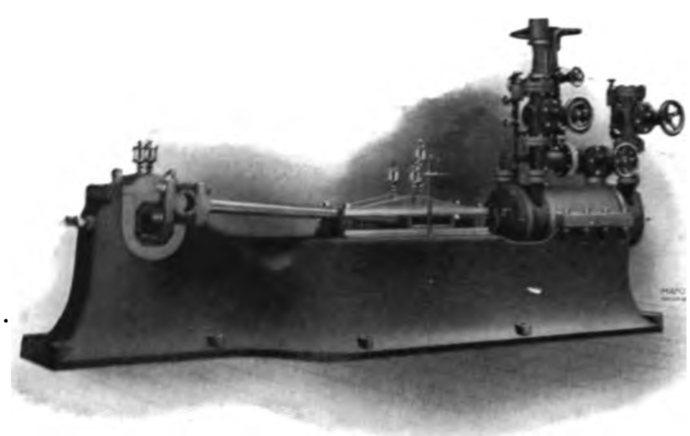
THE BARBER COMPRESSOR

Refrigerating and Ice Making Machinery

Built in 20 different sizes, from 2½ to 50 tons. The first machine built in 1894.

OVER 500

in successful operation January 1, 1900.



WE MANUFACTURE

COILS

OF ALL KINDS,

Ammonia Valves and Fittings.

CATALOGUE SENT ON APPLICATION.

TEXAS BRANCH,
177 Main St., Dallas, Tex.
NEW YORK OFFICE,
Townsend Building,
Broadway and 25th Sts.

BUILT BY

A. H. BARBER MFG. CO.

229 South Water St.
CHICAGO, ILL.

GEORGE M. BRILL, M. E.

CONSULTING ENGINEER

SPECIALTIES

ENGINEERING OF ELECTRIC POWER PLANTS, COLD STORAGE AND REFRIGERATING PLANTS

Local and Long Distance Telephone MAIN 1943 • 1143-4 Marquette Building CHICAGO

"Purefiant Cylinder Oil"

makes the recovery of **pure water from exhaust steam** an easy matter. **Clear ice,** free from color or deposit, the result. Write us for information, etc.

THE NANSEN CO., P. O. Box 20, Elizabeth, N. J.

CARBONIC ANHYDRIDE ICE AND REFRIGERATING MACHINE

SEDLACEK PATENT

MANUFACTURED BY

Kroeschell Bros. Ice Machine Co.

29-39 Erie Street, CHICAGO, ILL.

Most simple, economical and durable. Applicable to all commercial purposes.

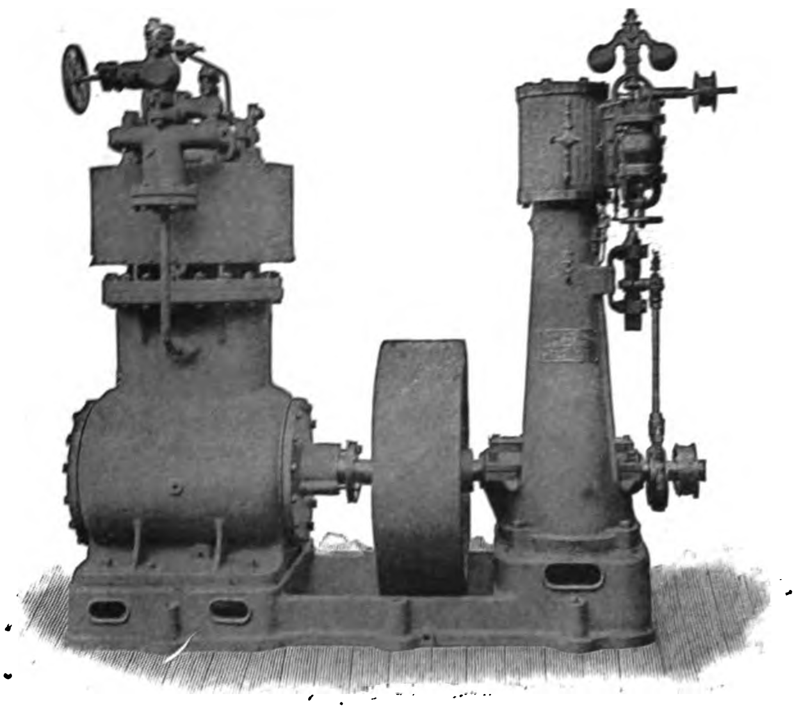
Complete installation for Ice Factories, Breweries, Cold Storage, Packing and Slaughter Houses, Hotels, Restaurants, Candy Factories. Also for Liquefaction of Carbonic Acid Gas.

No destructive fumes or poisonous gases. Complete safety of operation through the introduction of our safety device. Over 1,000 machines now in use.

(6)

THE ARCTIC

REMINGTON Ice Making and Refrigerating Machinery



REMINGTON DOUBLE CYLINDER ICE MACHINE

Complete Plants Erected and Guaranteed.
Ice Making by Can and Plate System.
Pure Ice Made from Sea Water.
Refrigeration by Brine Circulation and Direct Expansion Systems.

Ammonia Compressors..

Horizontal Double Acting, of Large Capacity, with Corliss and Slide Valve Engines.
Vertical Single Acting, of Small Capacity, with Engine Direct Connected, and with Fly Wheel Pulleys for Belt Power.

CATALOGUES AND ESTIMATES UPON APPLICATION

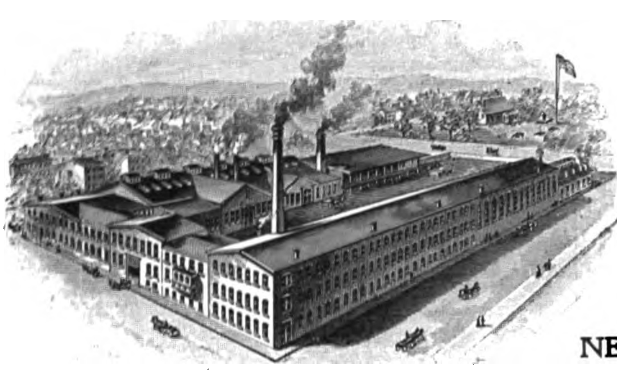
BAKER & HAMILTON, San Francisco, Cal.
SOLE PACIFIC COAST AGENTS.
NEW YORK OFFICE, 136 LIBERTY ST.

Remington Machine Co.

WILMINGTON, DEL., U. S. A.

W. R. NIFONG, SALES AGENT, 832 W. KING'S HIGHWAY, ST. LOUIS, MO.

EDGAR PENNEY, PRESIDENT AND MANAGER. ROBERT WHITEHILL, SEC. AND TREAS.
A. B. WHITNEY, VICE-PRESIDENT. GEO. B. SALISBURY, AUDITOR.

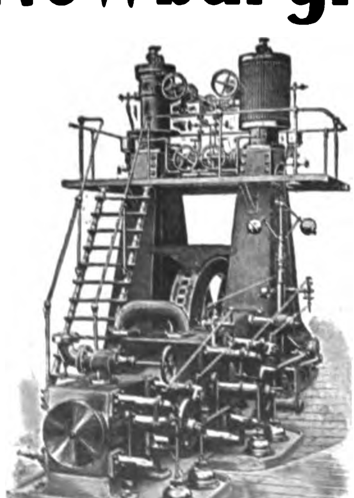


OFFICE AND WORKS, NEWBURGH, N. Y.

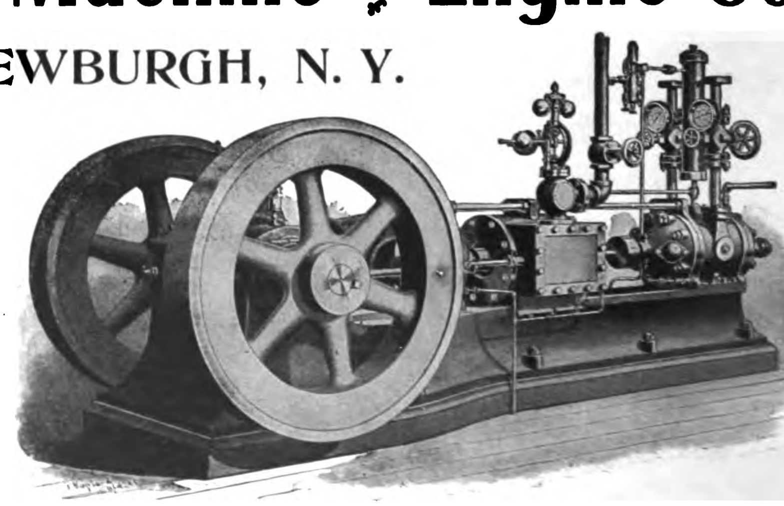
NEWBURGH ICE MACHINE AND ENGINE CO. NEWBURGH, N.Y.
PENNEY'S AMMONIA ICE MACHINES
WHITEHILL CORLISS ENGINES
OUR NEW PICTET-OXIDE SYSTEMS
STEAM POWER PLANTS

Newburgh Ice Machine and Engine Co.

NEWBURGH, N. Y.



Penney's Patent Vertical Single Acting Duplex Refrigerating Machine.



Penney's Perfected Horizontal Double Acting Ice Machine.

POLAR

Ice Making and Refrigerating Machinery

[illegible]

"BOYLE"

Ice Making and Refrigerating Machinery

GLOBE [illegible]

Engineers

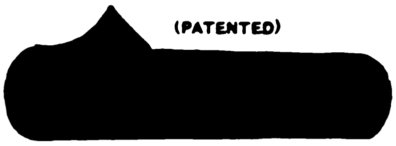
RIGERATING MACHINERY


ICE
AND
REFRIGERATIO

Plants

Granite Rock Wool Sectional Covering...

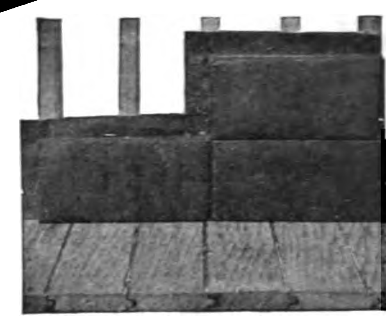
(PATENTED)



FOR HIGH AND LOW PRESSURE STEAM PIPES.

INSULATION FOR BOILERS TANKS, HEATERS, ETC.

GRANITE ROCK WOOL



IS PURE ROCK FIBER

WILL NOT PACK DOWN OR DISINTEGRATE. REQUIRES 4,500 DEGREES OF HEAT TO PRODUCE IT FROM GRANITE—NOT SLAG WASTE. IS AS DURABLE AS THE GRANITE ROCK FROM WHICH IT IS PRODUCED.

NON-PENETRABLE AMMONIA and BRINE PIPE COVERING.

MOST EFFECTIVE. REDUCES TEMPERATURE OF BRINE 20 DEGREES. PATENTED.

WATERPROOF NON-CONDUCTING TANK COVERING

SECTIONAL COVERING FOR EVERY PURPOSE.

SAWYER'S POLAR BRAND INSULATING PAPERS
SAWYER'S ALASKA BRAND INSULATING PAPERS
SAWYER'S POLAR BRAND INSULATING PAINTS

SAWYER'S HIGH GRADE

INSULATING PAPERS AND PAINTS

GRANITE GRAPHITE PAINTS
"NO BURN" GRANITE COLD WATER PAINT
GRANITE ROCK FILTERING FIBER

WRITE FOR DESCRIPTIVE PAMPHLETS AND CIRCULARS FOR ALL OF ABOVE MATERIALS TO THE

American Insulating Material Mfg. Co.

SOLE MANUFACTURERS OF

GRANITE ROCK WOOL

WE CARRY ON HAND AT ALL TIMES 500 TONS OF GRANITE ROCK WOOL, SO AS TO ENSURE PROMPT SHIPMENT ON RECEIPT OF ORDERS.

LARGEST EXCLUSIVE MANUFACTURERS OF
Insulating and Fireproofing Materials
IN THE WORLD.

General Offices, 213-215 N. Third St., ST. LOUIS, MO.
FACTORY AND WORKS, - - CARONDELET.
OFFICES, 2006 BALTIMORE AVE., KANSAS CITY, MO.
OFFICES, 506 GREAT NORTHERN BLDG., CHICAGO, ILL.

MINERAL WOOL

P&B

PAINT

INSULATING PAPER

...USE...

NEPONSET RED ROPE INSULATING PAPER

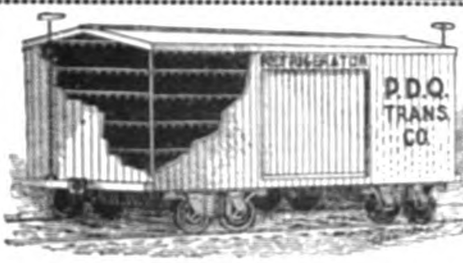
For lining Cold Store Houses, Refrigerators, Cars, etc. Waterproof, air-tight, clean, a high non-conductor.

This paper is accepted by experts as a standard of perfection. Made by

F. W. BIRD & SON, East Walpole, Mass.

WESTERN OFFICE, 1434 MONADNOCK BLOCK, CHICAGO.

Let us send you Samples



KEYSTONE HAIR INSULATOR

Julius De Long & Co.
Allegheny, Pa.

SEND FOR SAMPLES

DON'T DELAY

THE BEST AND CHEAPEST MATERIAL FOR

Lining Ice and Cold Storage Houses

CONTAINS MORE INSULATING VALUE THAN ANY OTHER MATERIAL.

WILL LAST FOREVER. IT IS LIGHT IN WEIGHT AND UNINFLAMMABLE.

IT CONTAINS MORE DEAD AIR THAN TWENTY LAYERS OF SHEATHING PAPER.

Liquid Air Refrigeration and Power Co.

[illegible] CHASE MFG CO [illegible]

A. J. CHASE, President.

MANUFACTURERS OF THE CELEBRATED

"Cold Blast" Refrigerators

[illegible]

Main Offices, Sudbury Building (Sudbury St.), BOSTON, MASS.

Graphite Lubrication.

There is no substance known so [illegible] as Dixon's Pure Flake Graphite. It is the best [illegible] natural [illegible] ever discovered. It is [illegible] affected by heat or [illegible]. It is [illegible] indispensable to every [illegible] stationary [illegible] engineer. It will pay you to send for Sample and Pamphlet. No charge.

JOSEPH DIXON CRUCIBLE COMPANY,
JERSEY CITY, N. J.

STEVENS' PATENT

Only Tight Door

FOR

Ice Houses, Cold Storage, Coolers, Refrigerators, Lime Houses,

and any and every place where an opening is to be closed tight and remain so.

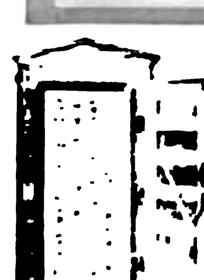
No rubber, no cloth, no felt [illegible] tight against the wind [illegible] water.

Door will not stick. The [illegible] edge fastening will never [illegible] door tight on the hinge edge [illegible] door [illegible].

Special pattern of hinges [illegible] door to slope and swing edge [illegible] clear of opening [illegible] trucks, barrels, etc. can [illegible].

[illegible] so bad but what can be [illegible] made tight and [illegible]. Doors and frames complete to fit any [illegible].

For overhead track or ice, with or without [illegible].



[illegible] the Stevens' Patent Open Pan System [illegible] and [illegible] for Butchers, Grocers [illegible].

[illegible] years I have used this system [illegible] many to [illegible].

[illegible] on application why [illegible] wasted and how doors are [illegible].

B. A. STEVENS, Toledo, Ohio.

LYTHITE

NONPAREIL CORK

LYTHITE

NONPAREIL CORK

remember that a city is great only in the achievements of its great citizens, and to let this memorial be an ever present reminder of a great and good man, once "a dweller within the city gates," and now at peace beneath—

That low, green tent,
Whose curtain never outward swings.

HON. GEO. P. RANEY'S ADDRESS.

My Fellow-Citizens and Friends. I wish that some one of the contemporaries of Dr. John Gorrie, identified with him in the early development of this locality, which in the latter days of Spain's dominion over Florida was made historic by the massacre of Lufburrow and his men, of the American navy, was here to speak to-day. The simple narration by any one of them of Dr. Gorrie's lofty position and signal efforts would be far more fitting and impressive than anything that can be said by a later generation. I wish that the earnest and forceful Baltzell, who subsequently became your chief justice, or that Davis or Semmes, both learned lawyers, one subsequently a general and the other a judge, and a member of that distinguished family which has illustrated both the profession of law and that of arms in its highest branches, was here to address you, or that any of his co-workers, that Dodge or Nourse, or Brooks, Chittenden, or one of the Porters, or Orman, or Ellison, or others that I might name, was present to tell, in plainest language, the story of his life and work. But upon a roll call of that company of his associates of those days not one survives to answer. Of all now within the bearing of my voice, not half a score can remember or ever saw Dr Gorrie. Forty five years devolve, with other results, upon a younger generation the duty that must now be performed. Born as I was in your midst, reared within your confines, educated in your schools, and bound to you by the strongest ties of personal affection, the obligation seems upon me, yet I have yielded only to a pressing sense of filial duty to this community and to the personal request of my friend and your esteemed fellow citizen, Captain Geo. H. Whiteside, whose absence to-day in response to public duty is so deeply regretted by all.

My personal recollection of Dr. Gorrie's appearance is quite clear, though, of course, my personal knowledge of him is necessarily very limited. Describing him as I did a few years since to his devoted friend and profound admirer, Dr. Alvin W. Chapman. He was of medium height, not of heavy build nor slight, of dark complexion, of serious, meditative and kind expression; and having the bearing of a thoughtful, studious and efficient man. I recall him distinctly in connection with two occasions, one that of his being at the home of my parents, whose physician he had been, but then doubtless called in specially, when some of the family were sick; the other that of my having been sent by my mother to his home (located about the site of the present opera house) for a prescription.

He was born in the city of Charleston, S. C., October 3 1803, and died here July 16, 1855. He was educated in the schools of Charleston, and was also, doubtless, a graduate of some medical college, but of what one I am not now certain. In the last interview it was my privilege to have, not more than two years ago, with Dr. Chapman, of whom this community was so proud and whom it loved so much, he told me of his having discovered a probable error in a statement made to him by Professor Gray as to the college of Dr. Gorrie's education, upon his pointing out to Professor Gray the grave of Dr. Gorrie in the old beach cemetery; but wherever educated, it is unquestionable from Dr. Gorrie's scientific productions and other writings that he was a man of culture and deep learning.

Deprived by death of his mother's love about the time of his maturity, he then moved to Abbeville, S. C. In a conversation which I had with my own father, whose admiration for the doctor's talents and skill as a physician was pronounced, and who was very prudent of speech, he told me of his impression that Dr. Gorrie had been an inmate of the family of the great Calhoun; from whom he doubtless imbibed, or had strengthened in him, the principles of democracy that he transmitted to his own brilliant son, whose marked talents were crippled by failing health, and who found an early grave. Dr Gorrie's advent to Apalachicola was in the spring or summer of 1833. This is made certain by a statement made by the doctor in a published letter now in my possession written by him under date of April 13, 1836, in which he says of this place that in a "continuous residence of nearly three years here I have never seen the thermometer above 90."

VIEW OF THE ASSEMBLAGE DURING JUDGE RANEY'S ADDRESS—GORRIE MONUMENT UNVEILING.

When Dr. Gorrie came to Apalachicola in 1833, he found the town entering upon the progress at last made practicable by the adjudication of the United States Supreme court affirming the validity of the Forbes purchase title, a litigation which had, through the adverse decision of the lower court and its attendant uncertainty, deterred investment and retarded the growth of the place. He found a population varied and impressive in its character; one which Dr. David L. White, the father of Judge P. W. White, of Quincy, characterized, as I have been told, the most heterogeneous that he had ever heard of. The extensive plans of the Apalachicola Land Company and of the Columbus company for the improvement of the town and the flattering prospects of the place for business and receipt and reshipment of supplies for the country bordering on the Apalachicola, Flint and Chattahoochee rivers, and cotton therefrom and the sale of such cotton, attracted not only those seeking labor and employment and professional occupation, but capital for investment and trade, and its representatives in various kinds of business. In the business year 1835-36 the cotton receipts were over 5?,000 bales. In the

contest for supremacy between Apalachicola and St. Joseph was prominent, but Dr. Gorrie's toast upon this occasion is indicative of the strong hope which the success of the enterprise being celebrated gave to this community over its rival. He said: "Our neighbors of St. Joseph—competitors in trade, but more successful rivals in courtesy and hospitality—we wish them health and prosperity."

The third aspect in which I would have you consider Dr. Gorrie is as a physician and neighbor, or in other words the estimation in which he was held by those among whom he lived and practiced his profession. As I have indicated before, I was too young to have had a personal knowledge of his characteristics. I cannot tell you, from my own observation or personal estimate of him, what he was; but after I had reached mature years I was thrown intimately with those who had been his contemporaries and were his survivors, those who still lived after both he and his son had been taken away, and could have no motive for insincere praise. This, after all, is the best test of a people's estimate of a neighbor; and a community's measurement of one of their number after he has passed away, and there is no restraint upon free and just criticism, is the truest evidence of his worth. Never has physician lived and commanded among his neighbors greater confidence than did Dr. Gorrie among his survivors. This is true not only of his non-professional, but of his professional associates. After Dr. Gorrie had been dead twenty-five years or more Dr. Chapman and Prof. Asa Gray, of Harvard, upon one of their strolls passed near the grave of Dr. Gorrie in the cemetery I have mentioned, and from which his body has since been removed to the burying ground above the town. Dr. Chapman, stopping and pointing to the grave, said: "Gray, there is the grave of the man whom we all recognize as the superior of all of us," and Prof. Gray, inquiring who it was, was told it was "Dr. John Gorrie," and remarked that he had been at college with him, and that his standing there sustained what his subsequent career had established here. This incident I received from the lips of Dr. Chapman. I may well say that Dr. Gorrie was the last hope of this people when death threatened their firesides. It was once said in eulogy of a citizen of a not distant county that he had reversed the biblical saying that a prophet is not without honor save in his own country, and the testimony which Dr. Gorrie's surviving contemporaries have given of him justifies an application of the assertion to the doctor. His loving neighbors have been the adorers of his character and the perpetuators of his fame as a physician and a man.

The remaining side of Dr. Gorrie's life is that which addresses itself to the world and has led to the great honor of his name, which we now commemorate—that of the scientist. Though the scope of his thought included within its liberal breadth the commercial purposes to which his discovery has been applied throughout the civilized world, yet a spirit of humanity, the love of his fellow-man, alleviation of affliction, the comfort of the suffering, and the arrest of disease were the prompting source of his conception and the mainspring of the supreme effort of his life. It is not for me to attempt to explain here his method of depriving water of its heat and thereby converting it into ice. That he did it, and that on May 6, 1851, letters patent No. 8,080, to run for fourteen years, from August 22, 1850, were issued to him from the United States patent office, is an unquestioned fact. That he actually made ice by his process in this town has been affirmed by the statement of his contemporaries.

That this town was not only the place of Dr. Gorrie's residence, but the scene of his labors for years upon the subject of his discovery, and that here he died and is buried, is and should ever be a source of profoundest pride to every citizen of Apalachicola. It is a signal fact that he never seemed to desire to conceal the merits of his discovery or his knowledge of it or his faith in its worth. In a series of articles published by him over the signature "Jenner" in the *Commercial Advertiser* of this place he set forth to the public the claims and merits of his discovery. He was not a charlatan or pretender. He believed that he was right, and he was willing to submit to the criticism of the world the theories upon which he founded his plan and based his judgment. It is a fact which should not go unexplained that in his letters patent he is described as being of New Orleans; and the explanation of this which I have ascertained is, that it was an exaction made upon him by those who loaned him money to be used in the development of his discovery. He became greatly absorbed in his enterprise, and in his latter days virtually abandoned the practice of the medical profession, save to make special visits at the request of those to whom he had become attached by long association. It is sad to think of his being taken away without having realized the practical consummation that time has secured for his discovery.

It is lamentable, my fellow-citizens, that Dr. Gorrie did not live to see the full fruition of his hopes. He died, it is thought by some, deeply dejected in that he had not seen this consummation. It is written of him that in his last sickness, when the people of this community were constantly calling at his house and asking about him, he requested his wife that when he should be dead to let them come in and see his body. It seems to me that it may have been his thought that this privilege was the last tribute he could pay to a loving community. He was dying, I fear, without hope of the fame, that the successful confirmation of his work has secured him. But there is another scene, thank God, that is different from this. When I was asked by Captain Whiteside to speak here to-day, he sent me a letter written to him by Mrs. Sarah Gorrie Robinson, the only surviving child of Dr. Gorrie. I remember her as a happy girl in our school days at the old academy, the house now occupied by Mrs. Kimball. There is in that letter an expression which connects itself by contrast with any want of hope that may have marked Dr. Gorrie's demise. In her expressions of gratitude to Captain Whiteside for this perpetuation of her father's memory, she exclaims, "Then my father's name will never die!" It was a glorious thought, for what can there be to the heart of a child more gratifying than the thought that a parent's name will never die?

At that proud city upon the James, around which cling so many historic memories, is a statue distinguished both by the fame of him whose physical form it perpetuates, and by the uniqueness of its own origin. Lee's greatest lieutenant is there portrayed in bronze. It is the voluntary tribute of foreign adoration and foreign generosity. English admiration of military genius and Christian character has erected there with its own unaided means and without local contribution, upon Virginia's soil, an imperishable tribute to one who never trod England's domain, and who was survived less than two years by the cause for which he struggled, and in whose behalf he illumined the profession of arms. It is said—and never, so far as I know, challenged—that never has such a tribute been so paid to worth or talent. Different as were the martial scenes of Chancellorsville in May, 1863, and the quiet passing of life here in 1855; divergent as must have been the last mental conceptions of Dr. John Gorrie as he passed away under probably poignant disappointment of a practical fruition of his earning and labors, from those of Jackson as, leading in thought his struggling legions, he asked for his only less distinguished comrade, Hill; yet in the source of the mentioned tribute to the soldier there is suggestion of the origin of this monument to the physician and scientist. This pile, outside of the personal efforts of Captain George H. Whiteside, is the gift of those who are without identity with your town. Strangers to Dr. Gorrie's family, and moved by their estimate of his great service to mankind, and stimulated by the devoted efforts of your fellow-citizen, they have contributed of their means substantially the entire funds with which the name of your long departed fellow citizen is forever perpetuated by this monument. It is no ordinary tribute to Dr. Gorrie; it is a great and ever enduring honor to this community. Let us never cease to be grateful.

At the conclusion of Judge Raney's address Miss Metta Porter, daughter of the president of the Capital City bank of Apalachicola, and Miss Mary Porter, daughter of the clerk of the Circuit court, both young ladies nieces of Judge Raney, drew aside the flags which till then had veiled the monument, and a salute was fired under command of Capt. John Fisher. Judge Raney then presented the monument to the city in the following words:

the ladies of this land, that monument, which was reared 400 feet toward the heavens, would probably never have occupied the position that it does to-day. But it is there, and will commemorate for all time the great and never to be forgotten deeds of the founder of this nation, George Washington.

And now, in the name of the mayor of this city, and of its council, who have selected me to do so, I accept the monument erected to one of her great scientific citizens, and may it always be looked upon by the rising generation of this place, not only with affection, but as a memento that we held within our corporate limits a man whose fame is now known to all civilization, and I feel to say, and am authorized to say, that the council of the city, the people of Apalachicola and its mayor will take especial pride in seeing that that monument will occupy the place upon which it now stands, until time shall be no more.

An interesting feature of the occasion was the reading by Col. W. B. Sheppard of the following poem, written by Mrs. Clark I. Kimball, of Apalachicola.

ODE TO THE GORRIE MONUMENT.

Here, in the sunshine of a golden spring,
And soft air, fragrant with the breath of flowers,
Old age and manhood, youth and childhood bring
Their benisons and homage; ere the fleeting hours
Shall close this day, we dedicate to fame,
And to posterity bequeath an honored name!

Long years ago there walked these shining sands
A gifted soul. In homes of high and low
He came and went, with healing in his hands.
And ever as he heard the voice of woe,
His heart responded to the sad appeal,
He strove and labored for the power to heal.

The fires of genius, lit with strong desire,
Burning and reaching into heaven's blue deep,
Touched spark divine, and like Prometheus' fire
Was given man the power to make and keep
The crystal boon of Arctic glacier pure;
The boundless blessing and the fever's cure.

The luxury of palace tables wreathed
Is brought in reach of every humble cot.
From fevered pillows many a blessing breathed
Ascends to heaven's listening ear; and not
The alabaster box of ointment sweet
Can offering richer lay, at his dear feet.

The hurrying years are drawing to a close,
A century of deeds of noble souls and great,
And in the brightest galaxy of those,
We place the name of him who, seeking late
And striving for a boon to soothe and save,
Found blessings waiting in the prisoned wave.

Found magic healing for the sick and sore,
Found life and bliss for thirsting, fevered frame.
And grateful nations, ever more and more
Shall laud and honor an immortal name,
Whose luster brightens as its fame is known,
And thankful hearts have carved in lasting stone.

In this secluded land he sleeps to-day,
The fringed palm and whispering pine are near,
Their symphonies the soft salt breezes play.
The boon he brought to men, the world will hear,
Long as the cycles of the coming years shall move,
And man to brother man shall minister in love.

Thus, in a simple way, was erected a modest monument to a simple, modest, but great man.

——In one of the shops of the United States Cast Iron Pipe and Foundry Co., Cincinnati, Ohio, the company has fitted up a room with drawing tables, boards and T squares as a study room for the use of a number of its employes who are students of the International Correspondence Schools, Scranton, Pa. The class, which numbers about fifty men and includes the general manager, studies on "company time" and is supplied with drawing paper by the firm.

[*From Advance Sheets of* U. S. CONSULAR REPORTS.]

ICE AND ICE MAKING IN LATIN AMERICA.

REPORTS ON CONDITION OF ICE TRADE AND ICE MAKING IN CENTRAL AND SOUTH AMERICA—ICE PLANT NEEDED IN HONDURAS—LIMITED CONSUMPTION.

THE following reports from the accredited consular agents of the United States, under the several dates given, contain a brief but comprehensive account of the present condition of the ice trade and the manufacture of ice in the chief states of Central and South America and the adjacent islands. From the general tenor of the reports it appears that the very limited demand for what in this country is considered an indispensable necessity would scarcely encourage enterprise in the business of ice manufacture. However, in some states more ice plants, it appears, are needed, and it is by no means improbable that were greater facilities added and ice offered at a cheaper rate, its consumption would be augmented.

COSTA RICA.

U. S. Consul Caldwell writes from San Jose, under date September 16, 1899, as follows:

The ice business in Costa Rica is small. There are factories in San Jose, Port Limon and Punta Arenas; and several smaller towns are supplied from these. The consumption is not great, and the machinery in plants is capable of much improvement.

I am informed that the small consumption is not due to any lack of appreciation of the advantages of ice, but rather to the fact that the opinion prevails that the ice is not pure. If a factory equipped with the latest improved machinery were erected here to furnish ice made from thoroughly distilled water, and the public became convinced of the purity of the ice, the enterprise would probably be a success and the consumption of ice be very greatly increased.

GUATEMALA.

Consul General Beaupré, of Guatemala, under date September 5, 1899, writes:

There are two ice factories in operation in this city, and the demand is not equal to the capacity of the plants to produce. The use of ice is mostly confined to saloons, restaurants and hotels; and it is a rare thing for a family to own a refrigerator or to use ice, except in small quantities at intervals. Owing to the elevation, the weather is never very warm, and there is no probability of ice ever being used more extensively than at present, except in proportion to the increase of population. The machinery for another plant is here, but is not used because it did not prove profitable.

In Quezaltenango, the second city of the republic, there are no ice factories. Natural ice is obtainable and is used during a portion of the year, but the extreme elevation and cold climate of this city are sufficient to deter any one from engaging in this business.

At Retalhuleu, the terminus of the railroad running from Champerico, a port on the Pacific, into the coffee growing district, there are two ice factories, the ice being largely consumed on the coffee plantations. These factories are sufficient for the demand.

At Escuintla, a station on the Central railroad, about midway between the port of San José de Guatemala, on the Pacific, and this capital, is an ice factory which supplies the country along this railroad.

On the northern, or Atlantic, side of the republic there are no ice plants. At Puerto Barrios, the port from which the Northern railroad starts, there are received each week by steamer from New Orleans from thirteen to fifteen casks of ice, packed with 600 pounds, but weighing about 400 pounds each on arrival. This is distributed along the line of this railroad at a price approximating two cents per pound in United States currency. At present, there is not sufficient demand at Puerto Barrios to warrant putting in an ice plant; but should operations in the construction of the Northern railroad be resumed, as seems probable in the near future, an ice factory either at El Rancho, Gualan or Puerto Barrios would be profitable, for the country is extremely hot and tropical.

Aside from the probability mentioned above, I can see no favorable outlook for the establishment of ice plants or the sale of machinery for the manufacture of ice in this republic.

HONDURAS.

Under date of September 11, 1899, Consul Johnston, of Utilla, says:

There are ice plants in operation at Belize and Puerto Cortez; there is also one at La Ceiba, not running at present. The extent of the use of ice can hardly be estimated, as it is bought from the steamers at three cents (1.3 cents gold) per pound. If a small ice plant, not costing too much, could be established, there would be considerable demand. A plant that would have an output of from 500 pounds to one ton a day would be large enough, as the towns are small and the sale of ice is limited. If parties will correspond with Dr. Spencer Franklin, Utilla, they may find it to their advantage.

NICARAGUA.

Consul Donaldson writes from Managua, September 15, 1899:

An ice plant has been established in Managua since 1888, with a capacity of two tons per twenty-four hours. It furnishes ice to Managua, Granada, Leon, Chinandega, Corinto, and all smaller places connected by railroad and steamboats with Managua, and as far as Greytown, on the Atlantic coast. This plant is capable of producing twice the quantity of ice consumed in all these places.

Messrs. Chamorro & Pasos are now establishing an ice plant in Granada, which proposes to compete with the aforesaid. The plant was commenced three years ago, but for various reasons could not be made to work; however, better results are expected from a new boiler just received. Either plant being able to furnish more than is consumed, it is evident that one will soon have to go out of business. I am therefore inclined to discourage any further increase in the production of ice, while the country is in its present financial condition.

Both of the above mentioned ice machines are of American origin.

SALVADOR.

Consul Jenkins, of San Salvador, September 9, 1899, says:

The city of San Salvador (population, 30,000) has three plants, with a daily joint capacity of 25,000 pounds of ice, retailing at two cents (0.8 cent gold) per pound. The consumption does not exceed 5,000 pounds per day, owing to a lack of enterprise; there is no cold storage establishment; meat sold on the market has been killed the previous night. There is room for a well conducted slaughtering establishment.

The following gives the names of companies here:

C. D'Aubuisson & Cia.; Pictet system; refrigerant, sulphurous oxide gas; capacity of plant, 4,000 pounds; not in operation.

Bengoa y Cia.; confectioners; refrigerant, sulphurous oxide gas; capacity of plant, 1,000 pounds; operate principally for their own consumption.

The Fundicion Mercedes; compression system, with two independent horizontal compressors, each capable of producing 10,000 pounds; power, electricity.

Santa Ana has an estimated population of 25,000, and is supplied with two plants, producing each 20,000 pounds daily; retail price, three cents (1.3 cents gold) per pound. A. Cirors uses the Pictet system; refrigerant, sulphurous oxide gas; capacity of plant, 2,000 pounds. The Luz Electrica Co. has a compressor of German manufacture; capacity, 2,000 pounds; water power.

Sonsonate has a population of 12,000, and has two ice plants, with a joint capacity of 5,000 pounds, retailing at half a cent per pound. Messrs. Candel y Cia. use as refrigerant sulphurous oxide gas; capacity, 3,000 pounds. The Luz Electrica Co. has a compressor of German manufacture; capacity, 2,000 pounds. The low price of ice in Sonsonate is due to competition, the Luz Electrica having determined to control the ice business. The normal cost per pound was five cents (2.18 cents gold).

Ahuachapan, with a population of 10,000, has a single plant furnishing ice. The electric lighting company uses its water power to manufacture ice in the daytime. The system is that of the Vulcan Iron Works, of San Francisco; compression; refrigerant, ammonia; capacity, 3,000 pounds; cost per pound, twelve cents (5.23 cents gold).

San Miguel has a population of 2,000, and one ice plant; Pictet system; refrigerant, sulphurous oxide gas; capacity, 500 pounds; retail price, twelve cents per pound.

The water power in Salvador is very good.

Salvador is the only republic of the five in Central America that is paying silver, and it is a problem as to how long it can withstand the issue of forced currency adopted by its neighbors. It is passing through a financial crisis, brought about by numerous causes, chief being the fall in price of coffee in the last two years.

ARGENTINE REPUBLIC.

Consul Mayer writes from Buenos Ayres, September 25, 1899, that there is at present no chance for machinery at that place. Ice is manufactured in abundance, and from three to four ice machines are now for sale in the market.

Consul Ayers, of Rosario, September 21, 1899, reports:

There are five quite extensive breweries in Rosario, with plants for the manufacture of artificial ice for their own use, and a system of delivery wagons, quite similar to ours in the United States, for the supply of the product to consumers. Besides the breweries, there are two independent ice plants, whereby competition is created, the price to the consumer kept

within a reasonable limit, and, as a consequence, the consumption of this artificial ice during the long heated term is rendered considerable.

I think the ground in this direction fully occupied here, and would not counsel the establishment of a new plant in Rosario.

BOLIVIA.

Under date of October 20, 1899, Vice-Consul Zalles, of La Paz, writes that natural ice can be obtained at extremely low rates the year round, being brought by Indians from the slopes of the mountain Huayna Potosi. He knows of no ice plant in Bolivia, and is positive there would be no profit in such an enterprise.

BRAZIL.

Consul Furniss, of Bahia, October 5, 1899, says:

Ice making was commenced in Bahia several years ago by a Brazilian company; but, as there was no demand for the product, the manufacture was abandoned.

About three years ago a German purchased a second-hand ice machine at Pernambuco, moved it here, and commenced business; this has since been continued, though not always at a profit.

The machine in present use was made in Germany about ten years ago. It is capable of producing three tons of ice every twenty-four hours, but it seldom manufactures half that amount.

The factory is situated along the sea front, on a narrow street of the lower city, in the region of the coal deposits. It obtains its water from the city water supply, but during the period from January to July of this year, when, on account of the drought, there was no water flowing from the city mains, it purchased its water from springs, etc., near the city.

The ice is made in blocks about three feet long and five inches square, a block weighing ten kilograms (22.046 pounds). It is sold at present for 300 reis (four and one-half cents) per kilogram (2.2046 pounds), and is delivered at the door of the consumer from carts, which make one trip a day. It is also to be had at all hours of the day from three designated depots, situated in or near the residence district of the city.

I am unable to supply figures relative to the consumption of ice, but I have ascertained that it is very limited, and that the largest consumer never takes 100 pounds a day. Its use is confined almost entirely to the two hotels, four foreign boarding houses, half a dozen drink shops patronized by the foreign population, two clubs and a few foreign families. It is never used to preserve food, but only to cool drinks, either in the bottle or when concocted separately.

Butcher shops have no need for ice. All cattle are killed in the afternoon at the government slaughter house, and the meat is distributed the same day to the retail dealer, who hangs it up in his tile lined shop, which has wrought-iron doors and windows, so that air may freely circulate. As it is never hot here at night, and the meat is cut up and sold at retail the next morning, it is still fresh and without the least bit of taint or deterioration when prepared by the cook for 7 o'clock dinner, or more than twenty-four hours after butchering.

The local sanitary laws require that all meat or cattle killed one day shall be sold before noon next day, and, as all shops are daily inspected, just enough is killed to supply ordinary daily demands.

Grocers and other venders sell nothing that would deteriorate on account of lack of refrigeration. They deal only in foreign preserved butter and lard. All chickens and other fowls are dressed by the purchasers; while of fresh fish, which is hawked around the streets, there is not enough for daily consumption, and consequently no necessity for ice in this line.

Soda water fountains are unknown here; ice cream is a luxury very seldom indulged in, and even when used it is always made to order; while the little water ice used by the whole city would not consume anywhere near 100 pounds of ice a day in its manufacture.

Water for drinking is cooled in porous receptacles called "moringues," which are placed in the air, the cooling being done by evaporation. Every one has a number of these, and they make the water agreeable for drinking purposes; so that even Americans soon forego ice water, which is an unknown thing to the natives.

As there are so few uses for ice here, and I am reliably informed that the demand for private consumption does not materially increase, I am inclined to believe that the outlook for the establishment of a new factory or the sale of new machines is not very flattering. Perhaps, with more modern machinery, independent water supply, lessened cost of production and the adoption of our business methods, a plant would pay better and ice become more popular; but the fact remains that one could never hope for a large consumption in proportion to population, as compared with our cities, because the average Brazilian does not care for cold drinks.

Consul Kenneday sends the following from Para October 3, 1899:

There are two ice factories in operation here, the apparatus being of United States origin. The present charges are not so high, as competition has become sharp. The price has been cut in half, bringing the product within reach of the laboring class. A further reduction is confidently predicted, immediately upon the completion of the third ice factory, which is now being erected. This field of industry, however, is in its infancy.

There is plenty of money throughout northern Brazil. Para is a city of great thrift and enterprise, and is enjoying prosperity. The demand for American products continues to increase steadily.

Under date of September 25, 1899, Vice-Consul Krause, of Pernambuco, says:

There is one ice factory in this city; the consumption of ice here is from half a ton to one ton per day. There were formerly two factories here, one of which failed about two years ago. Ice is sold at present at two cents per pound, and is of good quality. When both factories were in existence, ice was sold for half a cent per pound. I do not think there is a promising outlook for the establishment of ice plants, or the sale of machinery for the wholesale manufacture of ice, in this city or district.

CHILE.

Consul Merriam writes from Iquique, Oct. 28, 1899:

There is but one factory in this city for the manufacture of ice. The machine was made in Germany.

Its capacity is eighty-four Spanish quintals (8,538 pounds) per day. During four months in the year the output is from forty to fifty quintals (4,264 pounds to 5,080 pounds); during the rest of the year it does not exceed thirty quintals (3,049 pounds), and sometimes runs as low as twenty quintals.

This machine is capable of producing an amount far in excess of the demand.

Consul Caples, of Valparaiso, Oct. 14, 1899, says:

Almost all the ice used in this district is manufactured by the breweries and bottling establishments; farther north, at Tocopilla, it is made by sea water condensing companies. It is almost impossible to approximate the quantity consumed, but it is large in proportion to the number of inhabitants, particularly in the central and northern portions of the district. It is used in breweries, bottling establishments, hospitals, hotels, saloons and families. An abundance of ice is produced, and, in my opinion, additional ice manufacturing establishments would have to meet serious competition. Existing factories have extensive plants, more than sufficient (as I am reliably informed) to supply the demand, and the establishment of other plants could scarcely be recommended.

Ice is sold at Valparaiso and Santiago at ten cents in Chilean currency per kilogram, retail, and wholesale at five cents per kilogram, which would be about one and one-half cents in United States currency per pound, retail and three-fourths of a cent, wholesale.

COLOMBIA.

Consul Shaw sends the following, dated Barranquilla, September 22, 1899:

There is in this consular district but one ice factory. This plant is located at Barranquilla, a city with a population estimated at between 40,000 and 50,000. The proprietor, Mr. Louis G. Pochet, holds a concession from the Department of Bolivar, which gives him the exclusive right to manufacture and sell ice in the Province of Barranquilla.

The plant has a capacity of five tons per twenty-four hours. The machinery was imported from the United States. At present, about one and one-fourth tons of ice are made in twenty-four hours, and this meets the demand.

The proprietor maintains but one retail establishment. No ice is delivered.

The retail price is seven and one-half centavos (equivalent, at the present rate of exchange, to 1.42 cents gold) per pound. Many consumers buy as small a quantity as one pound. The wholesale price in quantities of 100 pounds or more is five centavos (0.96 cent) per pound.

Some ice is shipped to interior points on the river, and to Cienaga and Santa Marta, coast towns north and east of Barranquilla; but, owing to the slow methods of transportation, a large percentage is lost on the way, and the retail price at the points of destination is often as high as forty centavos (7.61 cents) per pound.

There are ice factories at Bogotá, Cartagena and Honda.

I understand that a concession granting the exclusive right to manufacture and sell ice at Cienaga and Santa Marta was given some time since by the Department of Magdalena to a gentleman at Cienaga, a town about sixty miles from Barranquilla and twenty-one miles from Santa Marta, the capital of the department; and that the concessionary bound himself to furnish ice at a price not exceeding five centavos per pound; but he has thus far taken no actual steps to establish the business, and consequently the city of Santa Marta, with a population of about 7,000; the town of Cienaga, with a population of 12,000; and Pueblo Viejo, with a population of about 1,000—three points within a radius of eleven miles—are practically without ice, except such small quantities as are shipped from Barranquilla, as aforesaid.

It is claimed that the concessionary at Cienaga has allowed his rights to lapse. This, of course, would require an investigation through the department of Magdalena. It is probable that an ice plant will be established either at Cienaga or Santa Marta in the near future. One obstacle at present in the way is the great fluctuation in the value of Colombian paper currency. If the concession is secured, it should grant to the concessionary the right to regulate the price at which the product may be sold, according to the gold value of Colombian currency.

A party who has given the matter some attention informs me, as the result of his investigation, that until the advantages of its use become better known, the consumption of ice in that section will be limited to a small proportion of the population, and that therefore it would not be profitable to manufacture ice for sale at as low a price as five centavos per pound. From the small quantity of ice consumed in this city, it is evident that it is used by but a limited percentage of the population. In the districts where ice plants exist, the manufacturer has a monopoly of the business, and the prices are no doubt higher than they would be if free competition were allowed. Owing to this fact, the general population will not soon become accustomed to the use of ice, and the number of plants will be limited to enterprises which have obtained government concessions.

I know of one apparatus which has been introduced from France for the manufacture of ice for private use. Such appliances, however, owing to their cost in the first instance, and the trouble attending their use, have attracted little attention.

There are about forty-two steamboats plying on the Magdalena river. They vary in size from thirty to 313 tons. During the year 1898 these boats carried about 16,500 passengers up and down the river. The larger boats carry a small supply of ice from Barranquilla, which is as a rule exhausted during the first half of the nine days' trip from Barranquilla to La Dorado. An ice plant is now being built at Honda, a point just above La Dorado, the head of navigation on the Lower Magdalena river, about 600 miles from Barranquilla, which will enable boats to secure ice for the down trip. A sufficient supply of ice for the river steamers would greatly add to the comfort of many of those who are compelled to make the long journey from the coast to the interior.

During the month of August, 1899, animals were slaughtered for meat supply at the city of Barranquilla as follows: Steers, 459; cows, 320; pigs, 122—together with a large number of goats and a small

number of calves and sheep. Owing to the fact that there are no refrigerating plants, cold storage houses or cooling rooms of any character in use, meat not salted within a few hours after the animal has been killed becomes unfit for use. Some of the admirable appliances used in the United States for preserving meat and provisions in warm weather ought to be introduced. I believe their use would prove advantageous from an economical standpoint, to say nothing of their desirability from a hygienic and sanitary point of view. As appears from the records of the custom house at this port, during the year ended June 30, 1898, ice machinery and supplies for same were imported as follows:

From.	Packages.	Weight.	
		Kilogs.	Pounds.
United States	22	11,772	25,952
France	1	167	368
Total	23	11,939	26,320

It is impossible to state just how much additional machinery, apparatus and supplies for the manufacture of ice were introduced under such general heads as machinery, drugs, etc.

The import duty on ice is one centavo, plus 20 per cent plus 25 per cent, or one and one-half centavos (0.28 cent in United States gold), per kilogram of 2.2046 pounds. The duties on apparatus and supplies for an ice plant will depend upon the classification of the articles used. Ice machinery and iron or steel fittings for same, not exceeding 1,000 kilograms (2,204.6 pounds) in weight, are included in fourth class, and pay five centavos, plus 20 per cent plus 25 per cent per kilogram. Ice machinery, including iron and steel fittings for same, exceeding 1,000 kilograms in weight, is included in second class and pays one centavo, plus 20 per cent plus 25 per cent per kilogram. Steam pumps, when accompanying the machine, are included in the class in which the machine belongs. Steam pumps alone and fittings for same, not exceeding 1,000 kilograms in weight, are included in fourth class, and pay five centavos plus 20 per cent plus 25 per cent per kilogram. Steam pumps alone and fittings for same, exceeding 1,000 kilograms, are included in second class, and pay one centavo, plus 20 per cent plus 25 per cent per kilogram. Iron pipes and accessories shipped alone are included in fourth class, and pay five centavos plus 20 per cent plus 25 per cent per kilogram. Substances such as ammonia, for the manufacture of ice, pay a duty of half a centavo plus 20 per cent plus 25 per cent per kilogram. Drugs in general, except those specially classified, are included in seventh class, and pay a duty of thirty centavos plus 20 per cent plus 25 per cent per kilogram. At the present rate of exchange —*i. e.*, 425 per cent premium for United States gold— the Colombian paper peso is worth 19.04 cents. Colombian import duties are payable in Colombian paper currency at its face value.

Attention is called to the fact that owing to the dangerous navigation at the mouth of the Magdalena river no ocean steamers, and but few sailing vessels, come to the port of Barranquilla; and merchandise for this city is discharged from vessels at Puerto Colombia (Savanilla), and must be transferred by railroad a distance of seventeen and one-half miles to the custom house at Barranquilla. The freight charges depend upon the classification of the article, and fluctuate according to the rise or fall of exchange. As an illustration of the present railroad charges on freight for Barranquilla, I give the rates on the following articles: Ice machinery, boilers and steam machinery, 12.67 pesos ($2.41) per ton of 1,000 kilograms (2,204.6 pounds); iron pipe, 8.20 pesos ($1.56) per ton of 1,000 kilograms. On explosives and inflammable substances a higher rate is charged: Ammonia, 8.20 pesos per ton of 1,000 kilograms; drugs not specially classified, 12.67 pesos per ton of 1,000 kilograms. Ice would pay 8.20 pesos per ton of 1,000 kilograms. On freight destined to interior points the railroad charges a higher rate. A more detailed report of the railroad company's freight classification would extend this report beyond reasonable limits. Intending shippers should fully investigate the same.

Consul Madrigal writes from Cartagena, September 5, 1899:

There is one small ice factory in this city, capable of putting out three and one-half tons in twenty-four hours; but the consumption is so small that only half a ton is used in the summer months, and 700 pounds in winter. This establishment is owned by Mr. R. C. Walters.

It will be seen that there is no opening here for the establishment of ice plants or the sale of ice machinery.

Vice and Deputy Consul Cobbs writes from Colon, September 5, 1899:

There is no town except Colon in my consular district that would consume a sufficient quantity of ice to justify the erection of a plant; and, as the Panama Ice Co. has a concession from the Colombian government for the exclusive manufacture of ice in the department of Panama, and furnishes Colon with the same by the daily train which connects the two towns, I consider the outlook for the establishment of an ice plant here anything but favorable.

Vice-Consul General Gudger, of Panama, September 26, says:

The right to manufacture ice in this department is sold by the government to the highest bidder. The concession is owned at present by a company in Bogotá, and the ice is manufactured in Panama by a plant which has a capacity of about ten tons per day. The consumption of ice here is not very great, on account of the price—five cents a pound.

ECUADOR.

The following, dated October 25, 1899, has been received from Consul-General De Leon, of Guayaquil:

There are no ice factories in Ecuador, except in Guayaquil, where there are three, two small and one large; only one is running, having arranged with the others to cease manufacture.

The capacity of this factory largely exceeds the demand. Most of the product is used by its owners in their brewery. These people consume little ice; ice water is regarded as unhealthy. Claret and other wines are drank by the better class; chicha, guarapo and mayorca by the poorer.

Ice retails at four and one-half cents gold. Perhaps two or three tons per day are consumed by this

city of 50,000 people. At Quito, the only city of any size in the north, no factory exists; the little ice obtained comes from Chimborazo.

There is no field either for the establishment of plants or for the sale of machinery in the line under consideration.

THE GUIANAS.

Consul Moulton writes from Demerara, September 14, 1899:

Plants for the manufacture of ice are established and in operation in this city, in Paramaribo, Dutch Guiana, and in Cayenne, French Guiana. Their capacity is sufficient to supply the requirements of the people residing in the respective localities.

About twelve tons of ice per day are annually consumed in Georgetown and other adjacent towns of this colony. The artificial ice plant which was purchased in the United States seven years ago furnishes half that amount, and two natural ice concerns which get their supply regularly from the United States yield the other half. Rain water is mostly used for drinking, for culinary purposes and for the manufacture of ice, because of a prejudice against other available water.

Many prefer natural ice, as it hardens and renders the soft rain water in which it is used more palatable. About five tons per day of artificial ice are consumed in Paramaribo, and about four tons in Cayenne. It is sold in those cities at two cents per pound. In this city it is delivered to consumers at half a cent per pound.

Seventy miles down the east coast from Georgetown is the port of New Amsterdam, with a population of 6,000. Thirty thousand dollars has been recently voted by that municipality for an electric light plant, which will be purchased in the United States. They are supplied with ice from Georgetown, which sells there at two cents per pound. Communication is now by water. In a few months, a railway will connect the two places. I am satisfied that a small plant established there would be a profitable investment. It will not be done unless by outside capital, which would also have to conduct the business.

With this exception, the outlook at this time for the establishment of plants or the sale of ice machinery is unfavorable.

PERU.

Consul Dickey, of Callao, November 29, 1899, says:

There are two factories for the manufacture of ice in Lima and five others in the coast and interior towns of Peru. The principal plant in Lima is a very extensive and modern one. It belongs to an English corporation called the Backus & Johnston's Brewing Co., Limited, and I am told that it can manufacture twice as much ice as is consumed in Callao, Lima and the surrounding country. The machinery for this plant was, I am informed, imported from the United States, and cost $35,000 gold.

Ice is extensively sold here in summer, selling at from three to five cents gold per kilogram (2.2046 pounds), and paying a tax of one cent per kilogram.

In my opinion, there is at present no outlook whatever for the establishment of ice plants or the sale of machinery for the manufacture of ice in Peru.

URUGUAY.

Under date of October 6, 1899, Consul Swalm writes from Montevideo:

An excellent ice plant is in operation here, controlled by the Consolidated Breweries; it meets the demand fully, and is ready to extend its machinery as the market may warrant. The plant (German) is modern in every way, and the product first-class. In my opinion, there is no opening here for new plants or machinery therefor. The use of ice is very far from being general; in fact, there is a deep prejudice against cold drinks or general food refrigeration as it is known in the United States. Fresh meat seldom taints, and the necessity for the refrigerator does not appear. Ice is sold at retail, delivered, at four cents the kilogram (2.2046 pounds) for domestic use, and two cents when taken for the use of restaurants by fifty or 100 kilograms. Ice is made at Paysandu, but its use will never become general, the cost to the consumer and the common prejudice against its employment preventing any great demand. For ships' use, ice costs $20* per ton at shore side; $30 per ton put on board, boxes to be returned.

VENEZUELA.

Consul Goldschmidt sends the following from La Guayra, September 7, 1899:

Ice is manufactured by three different concerns in Venezuela—one in Caracas, one in Puerto Cabello, and one in Maracaibo. The first has a monopoly granted by the government a few years ago, by which no other ice is permitted to be manufactured for sale or to be sold in the district of Caracas, which covers La Guayra. By the tariff which went into effect September 1, a duty of about twelve and one-half cents per kilogram is levied on ice imported into this country.

The ice manufactured in Caracas is of very inferior quality, coming in pieces about twenty inches long, five inches wide and three inches thick. The center is only half frozen, leaving a ridge having a density of frozen snow. This and the fact that the pieces are so thin cause the ice to melt quickly. Ice of this kind is retailed here at four cents per pound; it is consequently a luxury which few people can afford.

From one to three pounds are usually bought by the better families for breakfast and dinner. Such a thing as an ice chest is almost unknown.

People, as a rule, are not fond of iced drinks, one of the reasons being an exaggerated fear of harm resulting from their use.

Another reason for the small demand for ice is the fact that victuals, meats, etc., are not kept over night, as in the United States, but are daily bought in the market for immediate use. Such a thing as keeping meat in a refrigerator is out of the question; what is not used the same day it is purchased generally has to be thrown away. Consequently all meats are tough.

I think that ice machines of small size would meet with sale here and in Caracas, in hotels and in the better families.

Machines for the manufacture of large quantities cannot be sold here, except, perhaps, to the party having the monopoly for manufacture and sale in this district, to take the place of the one he has.

Electricity will probably be shortly introduced as a motive power in Caracas. Coal costs $15 or $16 a ton.

Consul Ellsworth writes from Puerto Cabello, August 31, 1899:

The brewery of Puerto Cabello manufactures all

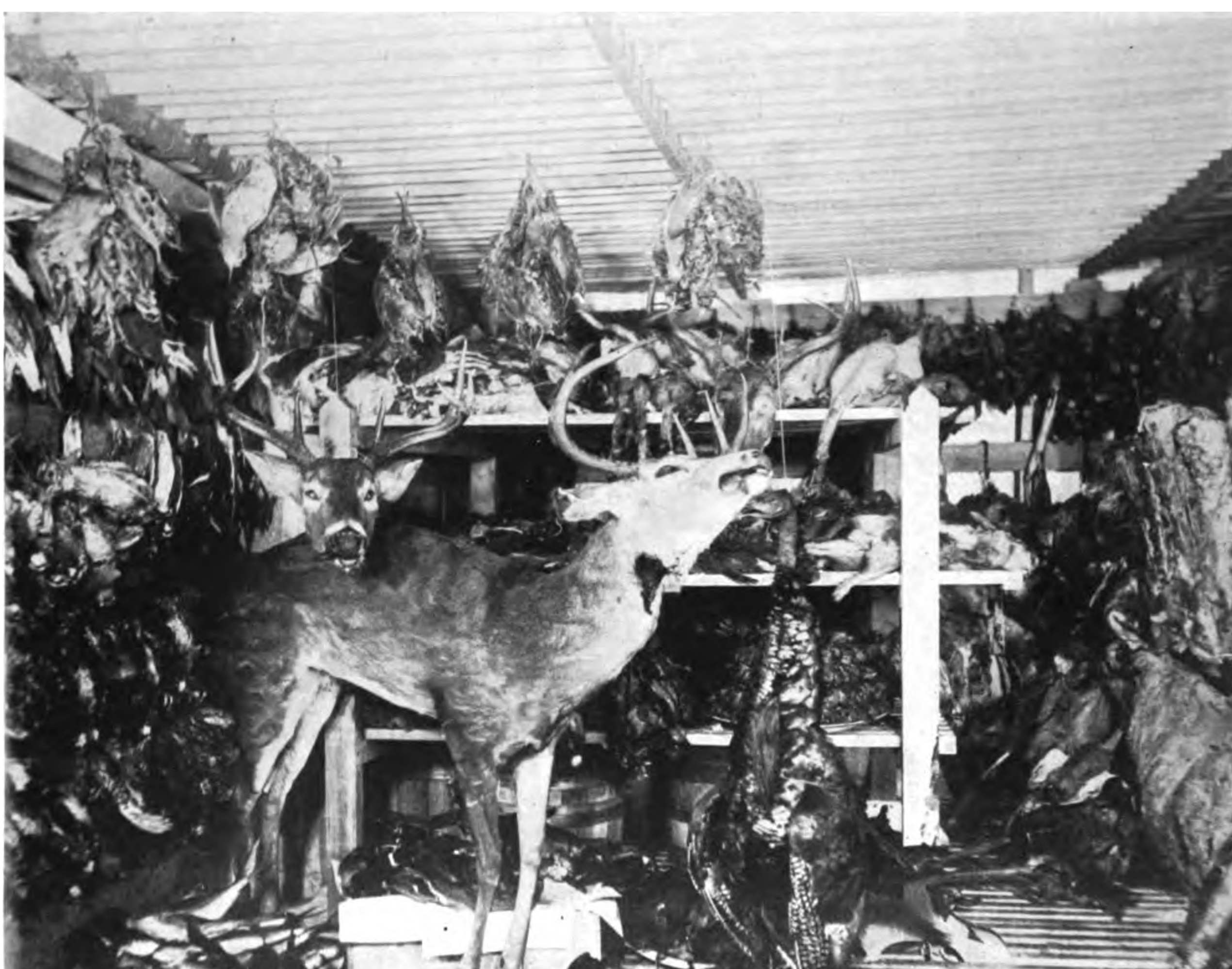
*Uruguayan dollar=$1.034.

the ice consumed at this port, and the officers of that company inform me that the consumption of ice in this city (population about 17,000) is from 500 to 800 pounds daily. The steamers occasionally take 1,000 or 2,000 pounds, but this cannot be counted on.

The cost of ice is four cents per pound. Were the price reduced, I doubt whether 500 pounds more would be sold, as the majority of the people do not care to use it.

The saloons, hotels and the like use practically all the ice that is consumed. The brewery has fine buildings, latest improved machinery, etc., and turns out a fine quality of beer and ice.

The outlook for establishing ice plants or selling machinery for same, in this district of Venezuela, is not good at the present time.



VIEW OF INTERIOR OF CHARLES SCHIMPF'S COLD STORAGE BOX—MOBILE, ALA.

A WELL FILLED COLD STORAGE BOX.

THE people of the south have never been behind their brethren in the north in the enjoyment of the necessities and delicacies which nature furnishes in such prodigal abundance for human sustenance. Nor were they slow to adopt the advantages which the inventions and the art of man have placed within their reach.

Many who attended the ice manufacturers' convention at Mobile may have noticed the display of "good things" through the refrigerator window in the cold storage boxes of Caterer Charles Schimpf, of that city. The accompanying illustration was reproduced from a photograph of one of these boxes, which contained, at the time the picture was taken, the following generous supply of crude attractive eatables:

Two thousand quail, 1,000 doves, 60 pairs of teal ducks, 50 pairs mallard ducks, 12 pairs canvasbacks, 5 dozen woodcocks, 5 deer, 75 loins of beef, 500 to 600 pounds of fish, including pompano, mackerel, sheepshead, fresh water trout, salt water trout, etc.

Wild turkey, plover, snipe and squirrel are also apparent among this collection of fowl, fish and forage, served from time to time, to gratify the somewhat epicurean tastes of Mobilians or of the strangers that might chance to be within the gates of their beloved city.

Other boxes in the restaurant are used for storing wines and beer, for provisions, etc. All the boxes are cooled by means of a refrigerating plant operated by electric motors, which also serve to supply current for the electric lamps which light the establishment. Two refrigerating machines keep the temperature of the boxes at any desired degree, from the 36° to 40° for fresh fruits and vegetables, to the sharp frost of the meat and game storage room.

—The Tasker & Julius Cold Storage Warehouse Co., of Philadelphia, Pa., was formally opened and inspected by a large number of merchants and others invited by the company. Most of the visitors were surprised to find a solitary cat in one of the large rooms, showing a temperature of 8° above zero, which was apparently contented in its frigid surroundings. The cat had been started on its cold life as a kitten in a temperature of 32°, and had been gradually accustomed to colder air until it made no effort to leave its environment of 8° above.

[*Prepared for* ICE AND REFRIGERATION.]

METHODS OF INSULATION.

PROPOSED PLANS FOR INSULATING WALLS—REPLY AS TO OPEN VS. FILLED AIR SPACES—REPLY BY A. SIEBERT—REPLY BY E. T. SKINKLE—M. COOPER'S REPLY.

THE following inquiry in reference to economical and efficient insulation for walls of cold stores, where a temperature ranging from 30° F. down to zero is to be maintained, covers a situation that has confronted many readers of ICE AND REFRIGERATION in the past, and doubtless will arise with others in the future. For the benefit of all interested, we append the inquiry as made, and the replies made thereto, by some whose study and experience have fitted them to give intelligent and trustworthy opinions on this subject. The letter of inquiry ran as follows:

METHODS OF INSULATION.

To the Editor: Having some insulating to do on both ordinary cold storage rooms of about 30°, as well as on low temperature rooms, ranging from that point downward to zero, we should like to avail ourselves of an inquiry through the columns of your journal as to whether our proposed plans are open to objection.

Part of our buildings have brick and stone, and part have wooden walls. We have not considered using walls of double masonry with pitch between, as we cannot obtain additional ground alongside our present walls, and we do not think adding an inner wall and filling between the two would be either substantial or economical in construction, and doubt if it would defeat transmission of heat well enough to be economically successful, on temperatures as low as 30°.

Many constructions of insulation have been suggested to us, some adopting, and some discarding, air spaces. Those discarding air spaces seem blindly extravagant of lumber, often using six and sometimes eight and even ten courses of boards on the inner side of the wall.

Those advocating air spaces seem to differ greatly as to their number and extent, as well as to the amount of lumber to be used. Some advocate very thick air spaces, using six boards and large scantling, involving very thick walls, with consequent reduction of storage room. Others advocate as an opposite extreme two courses of boards only, one on each surface of the wall, with a number of thin air spaces, formed with paper only, secured by thin strips.

A third character of wall, vigorously denounced by advocates of both the preceding, has filled air spaces. While its advocates argue about the relative merits of different filling materials, those who object do so on the ground that in cold storage, moisture will penetrate and saturate any and all fillings, thus converting each and every one into a rapid transmitter of heat, instead of a slow one.

So far as we have seen, this saturation is usually confined (in houses not kept in sloppy condition) to the lower edge of the wall, close to the floor, and seems to be mainly a result of imperfect joining of wall and floor, or the use of paper that is not moisture proof.

The filled air space construction seems to be best in accord with good philosophy, and we feel disposed to its adoption for our work. There may be objections more serious than we discern, and difficulties greater than can be overcome by the use of good paper. We shall be grateful for any light you can throw on the subject. R. J. D.

ANSWER.—The difference of opinions with respect to the use of air spaces and filled air spaces, upon which you enlarge in your letter, is probably due to the different effect which different kinds of heat, "radiant or conducted heat" have in each case. For purely radiant heat, such as is, for instance, given out by the rays of the sun, an empty air space inclosed in otherwise good insulating material, partly permeable for direct heat rays, would be no insulator at all, while a filled air space would be so to a comparatively great degree. On the other hand, for conducted heat, such as is imparted to the outside wall of a building (protected from the direct rays of the sun) from the surrounding atmosphere, an empty air space is one of the best, if not the best insulator. In the refrigerating practice both kinds of heat are to be guarded against in varying proportions, and, for this reason, the question whether filled or empty air spaces are to be preferred must be decided upon the merits obtaining in each individual case. Thus it may happen to turn out that in one and the same building certain walls exposed mostly to radiant heat would best be insulated by filled air spaces, while others not so exposed would best be insulated by empty air spaces.

In all cases, however, air spaces, filled or empty, form an indispensable element in the construction of insulating walls, as far as we understand the matter, and this element cannot be replaced in a practical manner by a multitude of courses of boards, which, as you state in your letter, are preferred by some of your advisers. But whether you use empty or filled air spaces, it is equally indispensable that in the case of the former the air must be inclosed between partitions *practically air tight*, and in the case of the latter the filling of the air spaces must be kept absolutely dry.

ANSWER.—*By Alfred Siebert, of St. Louis:* If space for cold storage is very valuable to you, have the brick walls of the building coated on the outside with air and water tight plaster or enamel paint. Then plaster or provide a heavy coat of tar and pitch mixed, for the inside of the walls, making the mixture so that it will not melt by the heat in summer, nor crack when the desired temperature is maintained in the rooms.

In this manner you form an excellent and very thick air space, in which the air absolutely cannot move, and you have therefore what is called still air, which is considered by far the best non-conductor (see "Compend of Mechanical Refrigeration").

Against the wall secure 4×4-inch posts, with wall hooks, but erect them before you paint the walls, so as not to break the coat with the hooks; better still, paint the uprights also. Against this put two layers tongued and grooved ⅞-inch boards, both crossways, but breaking joints, so as to prevent exposing the paper at both sides at the same time, if boards should shrink, which they will only do in width. The paper must be tightly clamped between the boards, as much as possible by nailing, so that no injury to the outer boards will affect the insulation more than locally; and when the boards shrink only the paper should be exposed, so that the air and moisture cannot reach the inside of the boards and rot them. For protection against moisture the boards inside should be varnished, or oiled, or painted; it is easy then to keep them clean, as otherwise stains will enter the wood too deep to be erased, and this makes the whole room look unclean and uninviting to prospective customers.

Have the paper well overlap the next layer, and paint joints with P. & B. or other good paint, and on all corners, sides, top and bottom have the paper overlap

about two inches, and put cornice pieces in all corners, laid in paint; in fact, do not leave a hole even as big as a pin would make anywhere. Horizontally between the 4/4 posts put thin rough boards just as wide as the posts are, at a distance of twelve inches apart, up and down. Nail them to the studs and make them as close fitting as can be done in the saw mill. You can space the posts by them and therefore get a good fit with little expense. If these horizontal pieces are placed closer, the air will have of course still less chance to move, and it will make the insulation still more perfect.

This gives then again still air, and is, as stated before, the best insulation known. I should advise to have an inspector to watch the carpenters closely while they erect the work; it will pay well in the end; careless workmanship will reduce the efficiency easily one-half. This holds good, even if filling of any kind is used, so there is no more safety in this direction, if the spaces are not absolutely air and water tight. Soon the air, carrying moisture, will reach the filling, and this filling, being colder, will condense the moisture, forming water and will convert the filling—for this matter any filling, even mineral wool—into a good conductor, and will rot the boards.

It is therefore evident that no filling which is not at least as good as still air should be used—except that if it is just as good as, but cheaper than, the horizontal boards, it might be used; but then comes another consideration. It is evident if the still air insulation consisting of so many cells, is injured by a blow, that the one cell is only affected, and the moisture cannot spread, and by drilling a hole in this part and blowing hot air in, can be dried out and the hole nicely plugged again.

The objection against filling is this, that if the partition is injured and the defect not at once remedied, the whole filling must be removed and the whole space affected dried out, and new filling put in, which means practically rebuilding and refilling the whole section. Besides, some filling attracts rats, and they will eat through the partitions to get at the filling, spoiling thereby every section they attack.

If it is not advisable to protect the outside of the walls, then a second air space, built exactly like the first one, must be added; and for rooms for temperatures considerably below 32° another air space must be provided.

ANSWER. *By E. T. Skinkle:* From data in my possession, and a review of the articles on insulation that have appeared from time to time in the columns of ICE AND REFRIGERATION, I deduce that dead air cells are the best form of insulation against the transmission or radiation of heat from one space or body to another, excepting, possibly, that form of insulation which is represented by the vacuum space, as illustrated in Dewar bulb, a form of insulation that could hardly be applied to extensive cold storage construction, and which, therefore, will not be given consideration. Taking the inquiry as given, the factor of importance to be considered would, in my judgment, be the proper ceiling of the brick and stone walls against the admission of warm air—making the walls as nearly air tight as possible—and this would call for an internal coating of an elastic nature, that would thoroughly fill all pores and interstices, and remain sufficiently plastic to prevent possibility of cracking and scaling off. Various filler paints, pitch and other compounds are frequently used for this purpose. The outside surfaces of brick and stone walls should be coated with whitewash, preferably put on with a jet spray, so as to thoroughly fill up all pores and irregularities in the walls. A whitewashed surface exposed to the rays of the sun and to warm air will absorb considerably less heat than will a surface not so coated. Modern high class cold storage construction calls for hollow tiling outside of brick and stone walls, leaving the tiling open at both top and bottom, to allow of escape of warm air at the top and admission of cooler air at the bottom, thus creating a circulation through the outer false covering, and protecting the solid walls from the action of the direct rays of the sun. The tiling is usually whitewashed as above suggested.

Inside the brick and stone walls the insulation is more frequently constructed of air spaces, composed of furring strips, with double saturated insulating paper between two courses of boarding, than in any other way. The larger the number of air spaces constructed in this manner, the better will be the character of the insulation; for example, three 2-inch air spaces would, undoubtedly, be three times as efficient as would one 6-inch air space. As regards the comparative values of wide and narrow air spaces, granting both to be thoroughly air tight, we would assert that a 2-inch space would be quite as efficient as a 6 or 12-inch space, provided the space were left unfilled; but if the space were filled with any good non-conducting insulating material, the wider space would, undoubtedly, prove the more efficient, and more efficient in proportion to the thickness of the filling. Taking one 6-inch space, filled with any given non-conducting insulating material, and comparing the same with three 2-inch spaces, constructed with double paper between double boards on each side of each 2-inch space, and the spaces left unfilled, the three spaces would show a greater efficiency than the one space filled with the insulating material. Then filling the three 2-inch spaces with non-conducting insulating material would enhance the efficiency over the construction when left unfilled. Dead air spaces, when left unfilled, are not as efficient as dead air spaces filled with good insulating material, for the reason that any leakage to the space would be likely to result in more or less circulation in the unfilled space, while the filling would have a tendency to retard circulation. Even in case of leakage of considerable magnitude, the filling divides the large air space into numerous cells of minute dimensions, offering obstruction to air circulation—and circulation is the assistant of heat radiation.

I think I am safe in asserting that the present practice of cold storage insulation construction would not average greater than three spaces, and that the spaces would not average greater than two inches in depth each, and further that the accepted practice is to use the best quality of saturated insulating paper, laid in double course, between two thicknesses of boards, on either side of each individual air space. Some architects and engineers recommend filling the

two outside spaces with insulating material, leaving the center space open without filling, while others recommend filling merely the center space, leaving the two outside spaces unfilled. I am of the opinion that the former, the two spaces filled, would prove the most efficient, and if I were to fill merely the center space I would construct that center space of a depth equal to the combined depth of the two outside spaces. I would not recommend air spaces constructed of paper only, neither would I recommend putting the paper on one side of the boarding only, as I believe the construction should be such as to be permanently stiff and substantial, and the paper should be protected from both sides. I therefore recommend using double course paper, laid one-half lap, between double courses of boards.

Average cold storage walls will not absorb moisture, unless the nature of the goods in storage is very moist, such as open casks of pickled meats, ice or other wet materials, and even with such goods, with proper circulation and ventilation, the walls would not absorb any appreciable amount of moisture, if the rooms are properly piped. I know of many instances where wet goods are stored in rooms above the freezing point, and yet a match can be struck on the walls at any point in the rooms. With anything like proper construction, and with sufficient piping, properly located, cold storage walls are more likely to dry out than to absorb moisture.

In conclusion, I would recommend three spaces, not over two inches deep each, with the spaces constructed with double paper between double boards, and two spaces filled with insulating material, as a practical insulation, and probably as cheap a construction as can be put up to secure efficient results for temperatures from zero to freezing point.

ANSWER.—*By Madison Cooper:* Your inquirer has very decidedly a mixed proposition. It sometimes occurs that a cold storage manager thinks to decide what insulation is best for his purpose by obtaining all possible information from several sources. From the variety of ideas given, it is generally impossible to decide. It is, in fact, difficult to give information which would be of value, unless all details as to kind and cost of material available, temperature at which various rooms of the building are to be held, etc., are known. No positive values for insulation of ordinary construction have been made public up to the present time, and the design and construction of same has been done by the merest guesswork and rule of thumb calculation, in a great majority of cases. The writer is at present engaged in a series of tests which should, if successful, throw some light on the subject. No results of consequence are at present available as a result of these tests.

It may be stated broadly that any particular construction will not be good economical insulation for all kinds of buildings and in all locations. Every locality has its most appropriate insulator, depending on cost of various insulating materials, and the character of building in which it is to be used. The temperature of rooms also has much bearing on the problem. Not knowing all of R. J. D.'s conditions, I cannot advise accurately regarding the most useful insulation to use for a given cost. Any and all of the constructions which he mentions as being advocated by different people, and which he is inclined to discard for the filled wall, or what he calls filled air space construction, are useful, usually combined together in one way or another. It is not plain why any of these should be "vigorously denounced" by an intelligent engineer. All the constructions mentioned by R. J. D., and others besides, have been used by me for varying conditions, except the double wall with pitch, or pitch and ashes between, and this, no doubt, has merit for some work.

The filled wall is usually extravagant of space. The wall, with many thicknesses of matched lumber, is extravagant of material. The thin air space wall is extravagant of labor. We can easily find fault with any of the constructions proposed. An intelligent combination of the various forms will give the best results as to economy of construction and the subsequent operation of the house. R. J. D. can well afford to employ a competent person who is familiar with the various materials obtainable, to design his insulation. A good engineer will make a great saving in the economical use of material and labor.

FROZEN EGG TRADE.

THERE has been considerable talk of late regarding canned or frozen eggs. I wish to call the attention of your readers to the danger of going into this new feature of the egg storage business without first learning its ins and outs. As a pioneer in this branch of the business, I wish to state a few of the difficulties to be contended with.

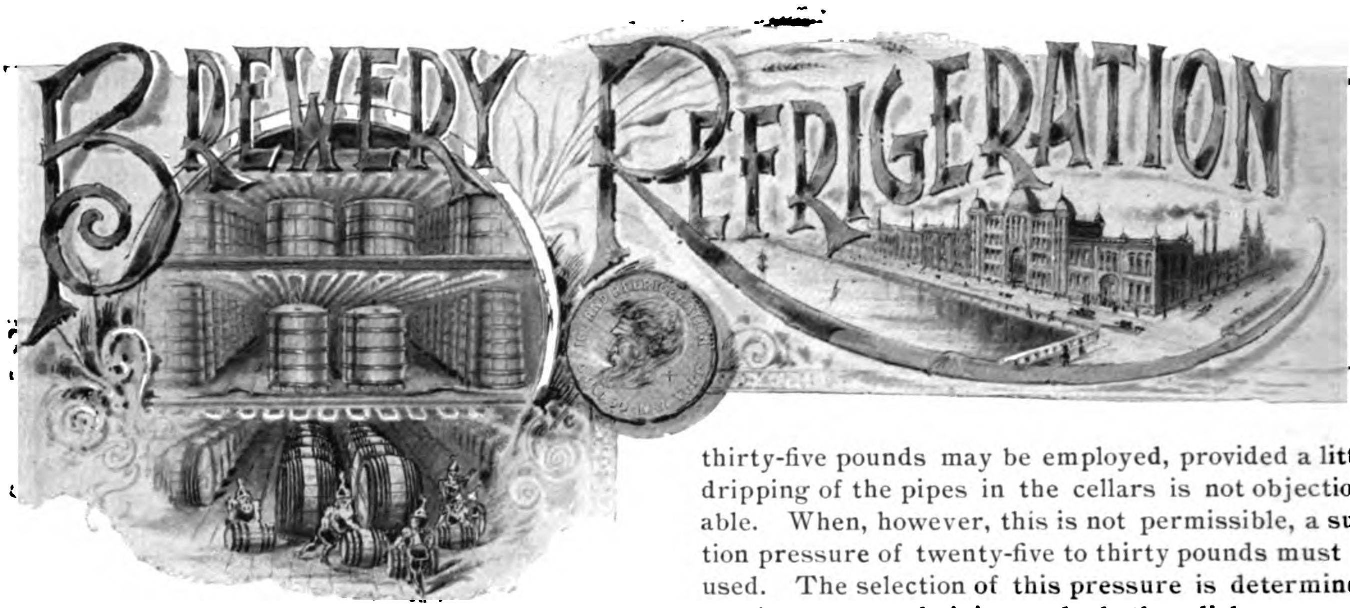
In the first place, many have a mistaken idea that any old eggs are good enough for freezing purposes. Nothing is further from the truth. If you want to avoid loss, the very best eggs must be put up. You can, of course, use cracked, dirty and small for freezing, but this class of eggs average much poorer than sound, clean eggs, and the liability of getting in a bad egg now and then is much greater. A musty or bad egg will spoil a whole package.

In the second place, it is difficult to get help who will properly judge the eggs which are put up. Each egg must be carefully watched as it is broken, and bad or musty eggs thrown out.

In the third place, frozen eggs are an extremely hard thing to sell and ship, and none should be put up unless contracted for. They can, if absolutely necessary, be carried over from one year to another, but the quality deteriorates considerably, and the carrying charges count up rapidly. I personally know of four different lots of frozen eggs which have been carried over from 1899.

I have seen it stated somewhere that a little water added to the eggs made them freeze better and work up better when thawed. I do not know anything about such practice, and do not believe it is best. It is not only adulterating a food product, but it must injure the quality of the eggs greatly.

That the frozen egg business is handled on a very moderate margin I am sure. I am equally sure that if egg shippers think to put their seconds into frozen eggs, they will make a failure of it. In conclusion, if you are going into the frozen egg business, go slow.—*Madison Cooper, in the Egg Reporter.*



[*Written for* ICE AND REFRIGERATION.]

WORT AND WATER COOLING.

ECONOMY AND EFFICIENCY OF COOLING BY WATER EXPLAINED—RESULTS UNDER VARIED SUCTION PRESSURES—AMMONIA COOLER—WATER COOLING—DIAGRAM.

By ALFRED SIEBERT.

WORT COOLING.

IT is of course necessary to cool the wort as far as possible by water, and the water part should be thirty-four pipes high if possible. With such height of cooler it is possible to exchange the heat so effectually that only about 4° difference exists between the wort and water leaving the cooler; it is understood that a counter-current cooler is employed, where the wort enters on top, and the water leaves the pipes at the top pipe. The ammonia part of the cooler should be so arranged that the highest possible suction pressure can be utilized.

Wherever it is possible, a separate machine with separate suction connection to the wort cooler should be employed for the following reasons: The highest possible suction pressure which can be employed is forty-five pounds. At this pressure the gas expands under a temperature of about 30°, which is sufficient to cool wort to 40°, which temperature is usually all that is desired.

It is not advisable to use a higher suction pressure for practical reasons, for as soon as the pressure goes to about forty-eight pounds the temperature of the gas will be 32° and above, and therefore the frost will melt off the cooling pipes and deprive the man handling the cooler of all signs by which he can control the expansion.

The cooler will do work even at this pressure, as there is still a difference of 8°, but as the attendant has no means of knowing the pressure of the evaporating gas, he cannot judge whether he is working to the best advantage or not, nor is it advisable to work with a smaller difference than 10°, as the cooler would then have to be considerably higher; should, however, such high pressure be desired, a pressure gauge must be provided to enable the attendant to handle the expansion correctly.

When the same machine is used for cellar work and wort cooling, and it is not desirable to shut off the cellars during beer cooling, a suction pressure of thirty-five pounds may be employed, provided a little dripping of the pipes in the cellars is not objectionable. When, however, this is not permissible, a suction pressure of twenty-five to thirty pounds must be used. The selection of this pressure is determined by the amount of piping and whether disks are used or not. With the proper amount of pipes in each cellar, and no disks, thirty pounds should do.

In order to get the best results from an ammonia wort cooler, no copper covered iron pipes should be used, as experience has taught that the copper can never be drawn tight enough over the pipes; it will always leave an air space between iron and copper, which retards the transmission of heat, air being a non-conductor, especially when confined, as in this case. The ammonia should enter the highest pipe of the ammonia cooler so as to get the best possible effect from the expansion of the gas. The liquid will fill the pipes to a less extent, giving more steam space; and since the temperature of the liquid and gas when it enters the cooler is of necessity higher than when it leaves it, the warmer wort will strike the warmer gas, and the coldest wort the coldest gas, giving the best possible results.

When the gas enters the cooler on top, however, the practice to freeze the cooler over before turning the wort on must not be followed, since the liquid running downward cannot absorb heat enough from the surrounding air while running quickly through the pipes, and will fill the cooler, allowing heavy back frost to the machine. This can be prevented by turning on the wort right after the gas has been turned on, then the liquid will from the start get its heat from the beer, and no back frost will occur.

To show how many pipes are required, a diagram has been prepared:

The upper part of the diagram *k h c g* represents in scale the heat volumes abstracted by a beer cooler, cooling the beer from 90° to 40° with a suction pressure of forty-five pounds. The horizontal lines in the upper part point with one end to the initial temperatures, and with the other meet upon the diagonal vertical line; these vertical lines indicate on line *k h* the number of pipes required for the respective initial temperatures.

The lower part of the diagram shows the reduction in number of pipes obtained by lowering the suction pressure of the machine, and of course with it the evaporating temperature of the ammonia.

Repeating the operation described before in the upper diagram, we reached line *k h*, and must now follow the oblique lines starting where the vertical

lines cross $k\ h$, until we reach the horizontal line in lower diagram, which starts at the suction pressure selected; then ascertain the number of pipes required for this suction pressure, by reading the figure on top and bottom of the nearest vertical line. If beer is to be cooled from 70° to 40° with twenty-four pounds suction pressure, follow horizontal line nearest to 70° until it meets the diagonal; follow downward the vertical line, joining both there, to $k\ h$, and then the oblique line meeting the vertical line on $k\ h = 30$. Where this line crosses the horizontal line, starting at twenty-four pounds, the value in number of pipes is found and read from the figure on top and bottom of the nearest vertical line, as described above, and found to be twenty.

The diagram is constructed as follows: The heat trapezium, $k\ h\ e\ g$, has been divided into twenty parts by twenty-one ordinates, drawn at equal distances, representing forty-two pipes of the cooler in pairs; $k\ v\ w\ g$ is one of them, but the other lines have been left out to avoid confusion, as they are only necessary for the construction. These twenty trapeziums represent now the heat volume abstracted by each pair of pipes. For the pair 41 and 42 it is the above, $k\ v\ w\ g$.

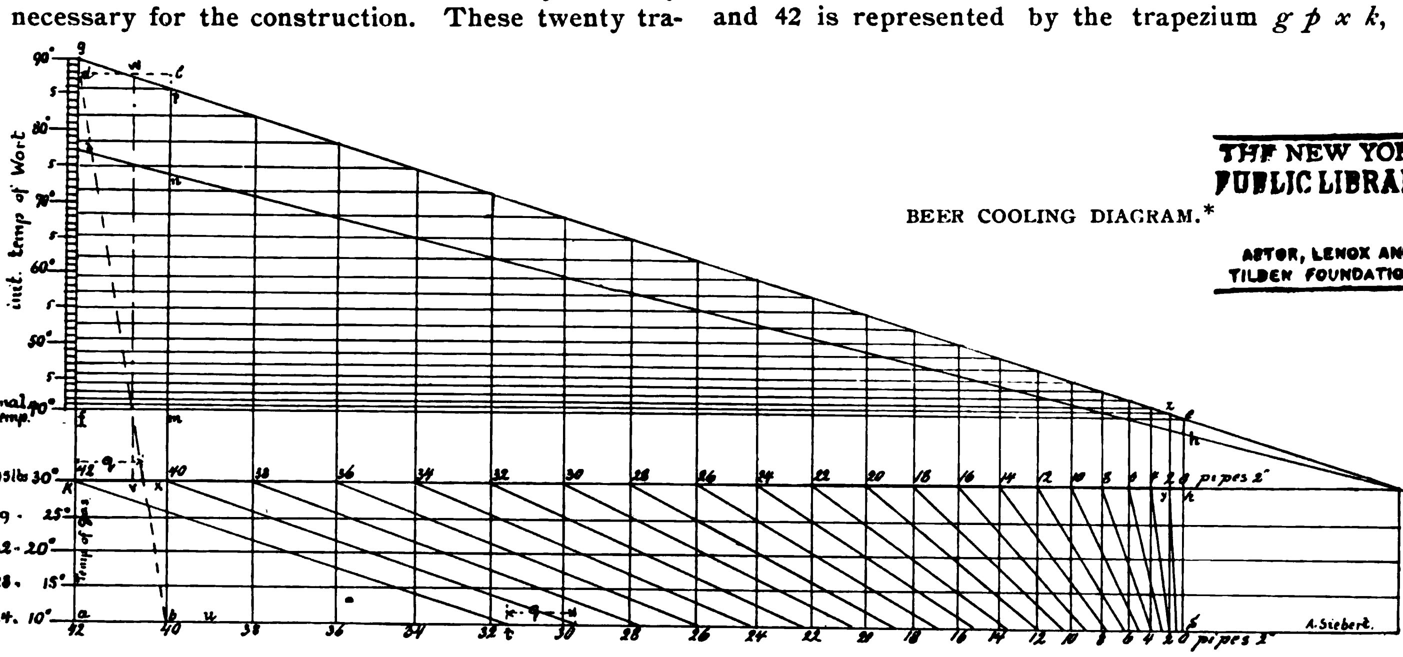
These trapeziums differ only in height, and represent in reverse proportion the pipe surfaces required to do the same amount of work. We know now that the sides of all these trapeziums must increase one-twentieth part of the total increase, or 90° — 40° = 50° or 2.5° per division, therefore they form an arithmetical progression, the first member of which is 10, and the rise per member is 2.5°, which figures we will call a and d, respectively. Calling further u = the length of the last member of the progression, and s = the sum of all members, we have the two equations $u = a + (n - 1)\ d$ and $s = \frac{a+u}{2} \times n$; n = number of members in the progression, or 21.

The line $h\ k$ represents twenty pairs of pipe spaces, therefore $s = 20$ and $u = 10 + (21 - 1 \times 2.5) = 6\ a$; and finally $s = 20 = \frac{a + 6a}{2} \times 21$, and $a = 0.27 = e\ h'$, and $u = 1.62 = g\ i$; u and a must now be in the same proportion, for $e\ h : g\ k :: 1 : 6$; and if this be correct (it was our proposition to make it so) a line drawn through o in the distance of 1.62 (the unit is one-twentieth of $k\ h$, the pipe scale) down from g to i must pass e in a distance of 0.27 (same unit) $= e\ h$, which it does, proving that our assumption was correct, as the new values and the height of the twenty heat trapeziums drawn at equal distances are parallels in ths same triangle, so any line drawn from the point o must divide the parallel lines proportionally.

These pieces of the verticals situated between lines $o\ i$ and $o\ g$ must now be transferred on the pipe scale $k\ h$, starting with the greatest value at pipe 42, and so on to the last value, $e\ h$, for pipe o. We have thus found the heat value of each pipe from 42 down, and have placed the corresponding numbers on top and bottom of the vertical lines in lower diagram.

If we want to use a lower suction pressure than forty-five pounds, we must make a reduction in the pipe number and find first the decrease of the pipe surface, say for a suction pressure of twenty-four pounds. The pipe surface for the pair of pipes 41 and 42 is represented by the trapezium $g\ p\ x\ k$, which is equal in volume to the rectangle $d\ c\ x\ k$, and its height is $k\ d$, while the new pipe surface area has a height of $a\ d$. We must therefore transform the rectangle into another one of the same area, but of the height $a\ d$, and we do this by drawing the diagonal $b\ d$, and where this crosses $k\ x$ at v we get the new base $k\ v = q$. This is therefore the reduced number of pipes we require at twenty-four pounds suction pressure. Repeating this for all the twenty trapeziums, representing the different pipe surfaces, we get twenty values of q and must put them in proper rotation on line $a\ s$, representing twenty-four pounds suction pressure. Connecting the points so found with the corresponding points on the line representing forty-five pounds, suction pressure $k\ h$, we get oblique lines, which cut the lines representing thirty-nine, thirty-two and twenty-eight pounds suction pressure, respectively, in the proper proportion.

We have before traced the diagram for a cooler required to cool beer from 70° to 40° at twenty-four pounds suction pressure, and found that twenty pipes



BEER COOLING DIAGRAM.*

*It might be that the results obtained by using the diagram are either too high or too low in the opinion of the user. It is then only necessary to employ a co-efficient with which to multiply results to make these conform to his ideas.

were required; it would pay, however, to get a cooler with more pipes, and to work with forty-five pounds suction pressure. Using again the diagram, we find that thirty-one pipes—better for practical purposes thirty-two pipes—are required. While the first cost of such cooler would be higher, still the economy would be much greater.

Of course the cooler must also be longer, to run more beer over it (four barrels per running foot of cooler is required), but then the machine could cool, with the same number of revolutions and an increase of only 1 per cent of fuel, 54 per cent more beer per hour; $(24 + 15) : (45 + 15) :: 100 : x, \therefore x = 154$ per cent.

Or if this is not possible or not required, then the speed of the machine can be reduced, if it made fifty revolutions when working with twenty-four pounds suction pressure, to thirty-three revolutions $(24 + 15) : (45 + 15) :: x : 50$; $x = 33$ revolutions, and this would save $\frac{17}{50} = \frac{1}{3}$ of the fuel, as the increase per revolution is only 1 per cent of fuel at forty-five pounds pressure.

A few data may be mentioned here which will come handy in calculating the length of the cooler required and the work which must be performed by the machine to cool a certain amount of wort to a certain temperature.

Provide a cooler of such length that four barrels only are allowed to run over each foot of its length per hour. Approximately, to cool 100 barrels of wort 10° requires one ton of refrigeration. The rule is therefore: Multiply the number of barrels by the number of degrees you want to take out, and divide by 1,000; the quotient will give the number of tons refrigeration required.

WATER COOLING.

All that has been said above holds also good for water cooling, and such cooling should never be done in any other way, for instance, with the cooler submerged. Since it is a law that the transmission of heat increases in direct proportion to the velocity with which the water flows over the cooler, it is evident that if the cooler is submerged the velocity is almost equal to 0.

If we assume that we have an attemperator pump pumping twenty-two gallons per minute, and have an attemperator tank wherein the cooler is submerged, the velocity of the water would be just one inch per eighteen minutes, while the actual velocity of the water running over the cooler at the rate of four gallons per foot per hour would be twenty inches in one minute. It can be readily seen how inefficient a submerged cooler must be. Further, the efficiency of such cooler is impaired by the formation of ice around the pipes, ice being a non-conductor.

—Strawberry shipments north from the Carolinas and from Georgia, as well as other southern states, form an increasingly important factor in the refrigerator car business. The cars carrying the berries are provided with a large bunker at each end, holding two and one-half tons of ice. The blocks, as they come from the factory, are thrown in whole at first, and then the chinks filled in with smaller pieces until the bunker is as full of ice as it can hold. An instance of what the business amounts to is shown by one day's business at the ice factory of W. E. Worth & Co., at Wilmington, N. C. On May 7 fifty-six cars were iced, requiring the handling of 250 tons of ice between 7 A. M. and 7 P. M. Sometimes the work continues day and night, and on one long day at this factory 517 tons of ice were handled in twenty-one hours.

[*Written for* ICE AND REFRIGERATION.]

BEER BREWING IN MANILA.

SAN MIGUEL BREWERY'S EXCLUSIVE FRANCHISE—VARIOUS REFRIGERATING MACHINES USED—PRICE OF FUEL, LABOR AND BEER—INCREASE IN LOCAL CONSUMPTION OF BEER, ETC.

BY FRANK L. STRONG.

THE Gran Fabrica de Cerveza de San Miguel commenced business in 1890 in a modest way, its yearly output being but 500 barrels. The English brewer who was in charge made so poor a quality of beer that within a year he was succeeded by a German, whose experience enabled him to produce a much better article. The cellars were cooled by an old German absorption machine which had done duty in a southern island in ice making, been brought to Manila for the same purpose, and finally landed, with all its imperfections, in the brewery. The company struggled along with this machine, and finally discovered in Hong Kong an old Swiss Linde 10-ton compression machine, which they bought at junk prices. By better mechanical skill than Hong Kong had brought to bear, this machine was put in working condition, and, later, by substituting one good engine for the two bad ones, it continued to do service until 1899, when a new 40-ton Linde was purchased from Sulzer Bros., Winterthur Switzerland. Recently, upon the removal of the ice factory, the company purchased a small English Linde machine, which had been used for making ice for several years, the ice company (Fabrica de Hielo) having recently put up a commodious building fitted with the latest pattern Fred. W. Wolf Co.'s machine from Chicago, making twenty-five tons of ice daily.

The increase of refrigerating capacity is illustrative of the growth of the brewery. From 500 barrels of sour beer ten years ago, its annual output has grown to 25,000 barrels, and with enlargements now being made, another year will register the San Miguel as a 40,000-barrel house.

It is interesting to note prices compared with those in the United States. Mexican money is used here, \$2 of which, in round numbers, is worth \$1 gold. I have reduced the price quoted to a gold basis. Australian coal, of not as good quality as the best American, is now very high, selling at \$10 per ton of 2,240 pounds. City hydrant water is used, costing, when more than thirty cubic meters are used per day, \$0.015 per cubic meter, or a little less than six cents per 1,000 gallons. This water is pumped from a station on the Santolan river, some six miles from Manila, and is very good.

The wages of cellar and storage men is \$15, and of laborers \$7.50 per month. Engineers' and firemen's wages are low in proportion, all help being native. Some malt is brought from San Francisco, but most is from Austria, shipped via Hamburg. Hops are from the United States.

The selling price of the beer is \$22.50 per barrel (American size of thirty-one gallons). The company runs but six delivery wagons, as most customers come to the brewery for their supply.

The beer is of excellent quality, being made from the choicest materials, the only criticism being that

the extensive demand is a temptation to sell a little too soon after making.

Before the war the beer was shipped almost wholly to the provinces, but since the advent of the American soldier, who knows a good thing when he sees it, the consumption is wholly local. Even the natives are commencing to prove their capabilities of becoming American citizens by indulging in the San Miguel beverage. From the prices quoted, and an ever increasing demand, it is easy to demonstrate that the owners have a good thing. Let not your ambitious brewer, however, dream of packing his kit and following the setting sun to share in this good thing. Under the Spanish franchise granted this company they have the exclusive right in the entire Philippine islands, with their 1,000 miles in length, to manufacture lager beer by refrigerating process. That franchise expires in 1910. There is not the slightest objection, my brewer friend, to your making all the beer you choose in the Philippines, but you must leave your refrigerating machine at home, and even if you could cut ice in a city where the thermometer does not go below 60° F., you could not use the ice either. That kind of a franchise "cuts a great deal of ice," you see, and is the only kind of ice you would be allowed to use before 1910. What are you going to do about it? The treaty of Paris, made in 1898 with Spain, specified all existing franchises should stand. Were this the only one, possibly no one would care to open up an international question; but there are others. Some of them run so many years, and would seem to be so detrimental to public policy, as American ideas of progress construe them, that it would seem as if the franchise question must be reopened, and in a spirit of fairness, not inconsistent with the best interests of the people, be adjusted upon a new basis. In the meantime, the courteous gentlemen who own San Miguel appear to be happy.

COLD STORAGE OF BAIT IN CANADA.

FELIX S. S. JOHNSON, United States commercial agent at Stanbridge, Quebec, Canada, in a recent report states that one of the most important schemes which has occupied the attention of the Canadian government has been inaugurated this year, viz., the establishment of refrigerators for the storage of fresh bait by the government, in co-operation with associations of fishermen along the coast. Season after season the complaint arises that bait is scarce precisely when it is most urgently required, yet such bait can, as a rule, be obtained in abundance earlier in the season when the men are not in need of it. A parliamentary appropriation of $25,000 enabled the department of agriculture to remedy the difficulty. Bait associations were organized and freezers constructed.

Among the more important features characterizing the fishermen's bait associations are their entirely voluntary nature, the co-operative method of conducting them, the assistance by the Dominion government to the extent of 50 per cent of cost of building the freezers, and the payment of a proportion of the cost of operating the freezers. Each local association is required to receive, freeze and store for every shareholder a quantity of bait up to 400 pounds for each share held, and to furnish it during the fishing season as it is needed. Each fisherman pays a nominal charge for freezing and storage, and the association has the option of storing surplus bait and of disposing of it on terms agreed upon by the association.

The total expenditure for the different fisheries services during the fiscal year amounted to $417,601. This comprises: Fisheries proper, $95,278; fish culture, $34,522; fisheries' protective service, $105,133; miscellaneous expenses, $23,207; and $159,459 distributed as fishing bounties.

The total amount received during the same period as revenue from fishing licenses, fines, etc., is given at $85,502; this sum includes the $9,062 collected from the United States fishing vessels as fees for the *modus vivendi* licenses granted to their owners.

For the season 1898, the sum of $159,459 was distributed as fishing bounties to the deep sea fishermen of the Maritime Provinces. Of this amount, $63,461 was divided among the crews of 784 schooners, and the balance—$95,998—was shared by 23,500 boat fishermen. For the last year, Nova Scotia received about two-thirds of the fund; Quebec, $31,795; New Brunswick, $13,746; and Prince Edward Island, $10,188.

Since its inception (1882) the total sum of $2,681,368 has been paid in such fishing bounties to the deep sea fishermen of the above mentioned provinces. There were 80,000 men engaged during the season of 1898 in the fishing industry, using boats, nets and other fishing implements aggregating a value of $9,860,000.

The lobster plant alone is valued at $1,334,120. This comprises 814 canneries with 1,335,640 traps, giving employment to 16,548 persons.

The total value of the Canadian catch of fish for the year 1898 amounted to $19,667,126, a decrease of over $3,000,000 as compared with the unprecedented yield of 1897, but near the average of the previous eight years. The province of Nova Scotia easily led, the value of its catch being given as $7,226,035, with New Brunswick second, with $3,849,357, and British Columbia third, with $3,713,101.

Of the various kinds of fish caught the greatest value was in lobsters, representing $3,887,939; salmon of the value of $3,159,306 were caught; cod, $2,996,583, and herring, $1,987,454. In 1897 the value of the salmon catch was $5,680,174.

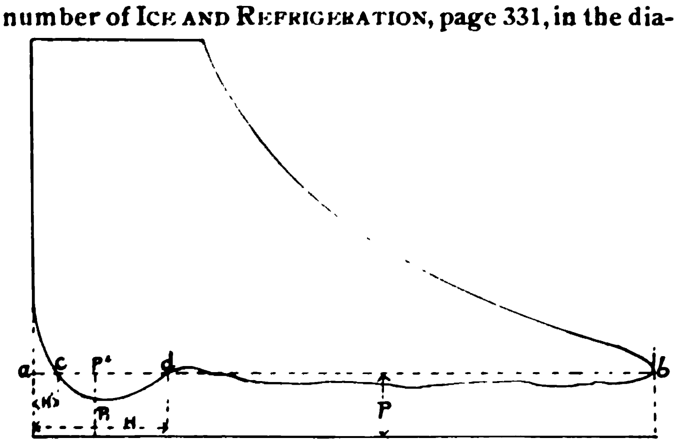
The early use of frozen bait in Canada dates back many years. According to a writer in the *Maritime Merchant*, a cold storage plant for preserving bait was erected at Canso, N. S., in 1887 and has been in successful operation ever since. At the outset, and indeed for some time, an unreasonable prejudice existed in the minds of many fishermen against the use of frozen bait, and many would stay at home when fresh bait could not be obtained, rather than use the frozen article. The prejudice has been lived down, however, and now frozen bait, chiefly squid, is considered a necessity. At Canso, during the so called winter haddock season, from $1,000 to $1,500 a day are paid for haddock caught with frozen bait, while ten years ago not a dollar was earned by the fishermen in this way at that particular season of the year. The same thing is also true at other points on the Atlantic.

CONCERNING PROOF OF EFFICIENCY OF ICE MACHINES.

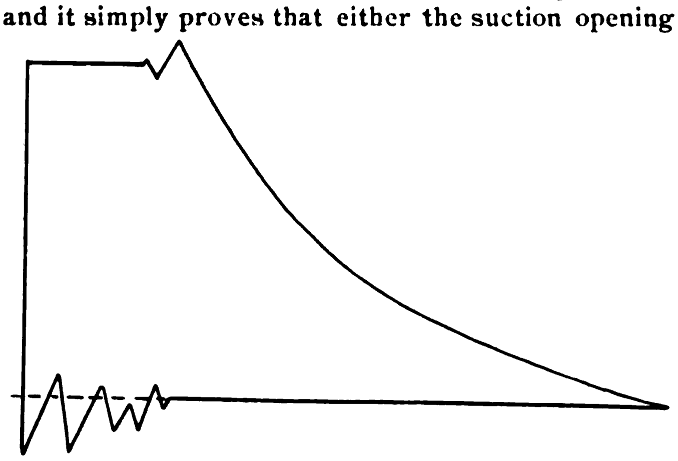
[Recognizing the value of more information about the use of the indicator to test the efficiency of ice or refrigerating machines in operation, we gladly give space to Mr. Siebert's criticism of an article on this topic which was published in these columns in April, and also append the author's reply to Mr. Siebert's criticism, believing the matter under discussion may prove of benefit to many of our readers.—Ed.]

MR. SIEBERT'S CRITICISM.

In the article on "To Prove Efficiency of Ice Machines without a Trial Test," published in the April number of Ice and Refrigeration, page 331, in the dia-



gram is a glaring error. The distance, H, given as the loss of admission is not right; it should be H_1. The writer will do injustice to the makers by his statement. The fact is this, that wherever the re-expansion line meets a line drawn horizontally through the intersection of a vertical line, forming a tangent at the point where compression commences, there the suction valve opens, and it is entirely immaterial how low the pressure falls below such horizontal line a b, since at b, when the suction valve is closed, the whole cylinder must have been filled with pressure, and it simply proves that either the suction opening



was too small, or (if the machine is single-acting) the piston valve very heavy.

It is evident, therefore, that the size of the suction opening cannot be considered too small, if only at the end of the suction stroke, when the piston works comparatively slow, it is like the evaporating pressure.

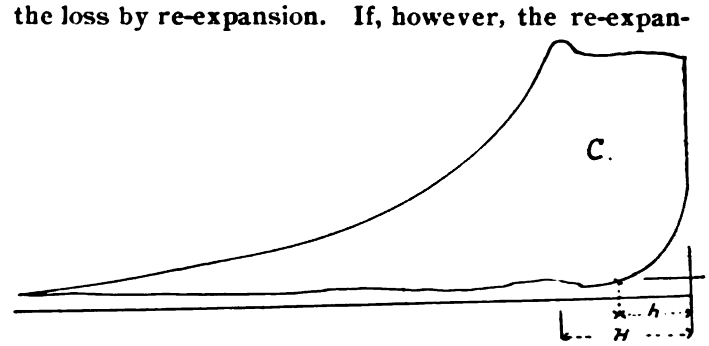
If there is no round corner at a, but it is a sharp point, it is sure that the suction opening is large enough; if it is not, that the piston or suction valve leaks, or else the latter does not seat promptly.

An old oil compressor showed a diagram as illustrated herewith, and, when working slowly, had absolutely a full charge admitted; and yet, according to the writer's opinion, the loss would have been about 10 per cent, while the zigzag line only indicated that the clapper valve used in this machine was heavy, and was moving up and down, closing and opening for some time, and therefore throttling partly the flow of the gas.

That this was the case was plainly noticeable by the noise these clapper valves made—a series of rattles. A. Siebert.

J. C. BERTSCH'S REPLY.

It is certainly an error to measure distance H as the loss by re-expansion Call the point where the line B B meets the re-expansion line H_1; then the distance between the vertical line, forming a tangent to the re-expansion curve, and the point H_1 is the loss by re-expansion. If, however, the re-expan-



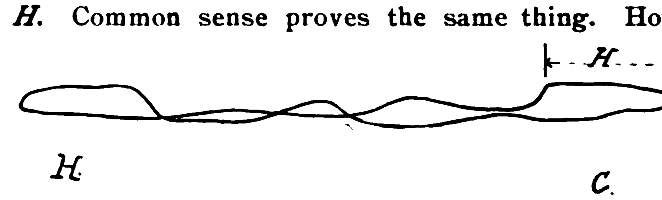
sion line is a straight, vertical line, the distance H_1 becomes equal to zero, and there is no loss by re-expansion.

Besides that correction, Mr. Siebert made some assertions which are dead wrong, and should not pass without a reply.

He states (1) that the suction valve opens at H_1, and (2) that: "If there is no round corner at B (at the beginning of compression), but it is a sharp point, it is sure that the suction opening is large enough; if it is not, that the piston or suction valve leaks," etc.

Apply the indicator to the suction pipe just before the entrance to the cylinder, and use a very light spring, and you will get a true picture of the movement of the suction valve.

Card II, taken simultaneously with Card I, is such a picture. It proves that the suction valve opens at H. Common sense proves the same thing. How



CARD II—SHOWING MOVEMENT OF SUCTION VALVE.

should it be possible that the pressure between H_1 and H falls while the suction valve is open? Mr. Siebert kills his own argument with the statement about the "clapper valve" of the oil compressor. When the valve opens the admission begins, and line B B is formed in a nearly straight line if the valve is well balanced, and in a crooked or zigzag line if the springs are too stiff.

The fall in pressure between H_1 and H simply indicates the work of overcoming the spring, or the adhesion produced by wet valve seats. As soon as

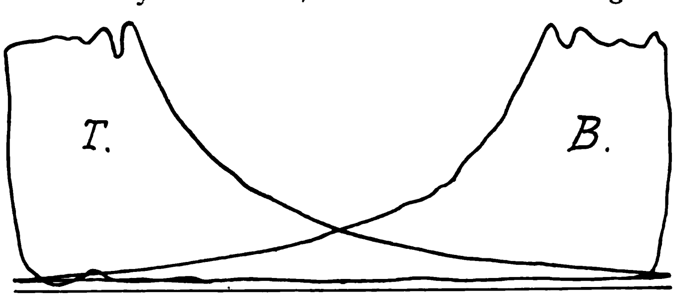
this work is done, the piston is at H, where the suction valve opens.

The fall of the pressure below line $B\,B$ is not an "entirely immaterial," but a very important factor, as it is impossible that the loss during $\frac{99}{100}$ of the stroke can be made up during the last $\frac{1}{100}$.

Where the compression begins there should not be, and, in fact, in a good machine there is not, enough "round corner" to find "the intersection of a vertical line forming a tangent," etc. There must be a practically sharp point, or else something is wrong. But by no manner of means can that sharp point be taken as a proof for a large enough suction valve or a leak of piston or suction valve. If Mr. Siebert would claim the "round corner" as such a proof, it would be more logical.

That sharp point has nothing to do whatever with the size of the valve. Then, a leak into the cylinder would increase the pressure, hence a "round corner," and a leak out of the cylinder would decrease the pressure; but such a leak is impossible, because the pressure in the cylinder is somewhat smaller than the one outside, both on discharge and suction side.

Besides all this, if the gas cannot enter fast enough during the nearly full stroke in order to keep in pressure closely to line $B\,B$, how shall it enter during the



CARD III—FROM AN OLD OIL COMPRESSOR.

small fraction of a second on the end of the stroke and in the same time make up for all the loss during the stroke, when the above mentioned quantity of work for opening the valve tends rather to close the same?

I give here a card of one of the "old oil compressors," just to show Mr. Siebert that not all of these machines give cards as he found them. His conclusions in reference to the full charge of the cylinder of those machines "when working slow," are wrong. Card III doesn't show many "zigzag lines," but quite a lot of H and H_1 and P about half what it ought to be, besides many other nice things.

This card was taken with thirty-three and one-half revolutions, and I should like to know how slowly such a compressor would have to be run in order to get P and H_1 correct.

Fortunately only some old compressors have a "clapper valve," and yet many other compressors give a "zigzag line," both on the suction and on the discharge side. What about the "clapper valve" argument in such cases?

In conclusion, I beg to state that I never intend to do injustice to any one of the makers. But as the subject is a very important one, my aim is always to adhere strictly to facts discovered by practical observation and study. J. C. BERTSCH, M.E.

Replying again to Mr. Bertsch, I have to say that my stating that the suction valve opens at c was not literally meant, but I use this expression always, because it expresses the fact that the cylinder is filled with fresh gas, represented by the line $c\,b$, the same as if the valve had opened at c. Mr. Bertsch is certainly mistaken about the point where the suction valve really opens, which will be clear to him, however, I hope, after an explanation of the admission line. It is first evident, if at b, the end of the admission period, the pressure p prevails, that therefore, the whole cylinder must have been filled with gas of pressure p. Part of this has been furnished by the gas which had filled the clearance, but this can only reduce its pressure to p, and is therefore represented by line $a\,c$. The suction valve did not open as it should have done when the re-expanded gas was reduced to pressure p, but stuck; consequently the volume $a\,c$ expanded further down to p^1, when the suction valve opened and admitted gas.

Of course the space $a\,p^2$ is now filled with gas of p pressure, but the re-expanded gas furnishes of this only the volume $a\,c$, while the fresh gas entered filled the space $c\,p^2$ without the piston needing to make a further motion.

It is therefore evident that whatever happens after the re-expanded gas has reached the pressure p is immaterial, except that if p is below the evaporating pressure, the admission port or valve is too small.

The card taken before the suction valve does not prove the assertion of Mr. Bertsch, as his distance $H = \frac{13}{16}$ inch, while $a\,p_1 = \frac{3}{4}$ inch, and $a\,d = \frac{7}{8}$ inch, so it can just as well be correct for both; but it should be $\frac{3}{4}$ inch, which difference may be accounted for in different ways, different reducing motions being used, and the cards, perhaps, not taken exactly at the same time.

Since I have taken thousands of cards from oil compressors while in the employ of the De La Vergne company, who are the only builders of single-acting oil seal machines with clapper valves, I should certainly know more about them than a man who has taken only a few.

While clapper valves are generally heavier and make more noise than poppet valves, the latter furnish, of course, the same zigzag lines as the clapper valves, when they are either too heavy or have too heavy springs. I think that everybody who is around refrigerating machinery notices the peculiar rattling noise of the suction valves, caused by seating and lifting of the suction valves in quick succession.

A. SIEBERT.

FREE ice to the poor in most of the larger cities proves the spirit of philanthropy in the ice man. In New York Jacob Ruppert & Son have pledged five tons daily throughout the heated term for the free ice fund. In Baltimore, Md., last year, the "free ice" distributed through one organization alone amounted to 113,275 pounds, and the work will be continued this season. At New London, Conn., the ice dealers have offered to furnish free ice to the deserving poor. At Kansas City, Mo., free ice will be distributed by the ice men through the instrumentality of the Salvation Army. Similar charities obtain in other cities.

RUINS OF THE PLANT OF THE STONE LAKE ICE CO. AT CINCINNATI, OHIO, AFTER THE FIRE.

Beginning at upper left hand corner is a view of ice tank; to the right of this is a view from top of boiler room. The second left hand picture presents a view of a corner of ice tank and tower; to the right of this is a view showing crane, suction line, center of tank, tower and stack. The lower left hand view shows top of water tower, etc.; while lower right hand view shows machine with tower lying on same.

BURNING OF THE STONE LAKE ICE PLANT.

THE views on opposite page, of the ruins of the extensive plant of the Stone Lake Ice Co. at Cincinnati, are reproduced from photographs taken shortly after the fire, and which we are enabled to present to our readers through the courtesy of the Triumph Ice Machine Co. The fire was discovered about 6 P. M., May 2, by an employe of the ice company, who was attracted by smoke coming from the vicinity of the boiler room. An alarm was at once turned in, but the fire had gained such headway by the time the fire engines arrived, that the entire plant was a total wreck. Everything outside of the heavy parts of the machine, ice tank, boiler and stack was destroyed. The four drums of anhydrous ammonia in the plant at the time were destroyed, bursting the drums and tank, and leaving not a perceptible odor.

The plant is located on Poplar street, near Linn, extending through to Livingston street. It was originally erected by the Poplar Street Ice and Cold Storage Co., and contained one 50-ton absorption and one 50-ton compression machine. The business was not a success, and in 1894 it was purchased at receiver's sale by Mr. Robt. R. Reynolds, on behalf of the Stone Lake Ice Co., of which he is president.

The new owners completely overhauled the old plant, and last season expended some $22,000 in equipping the plant with up-to-date apparatus, among which were two 60-ton ammonia condensers, which had but just been installed by the Triumph Ice Machine Co., of Cincinnati. The machine room also had been reconstructed, and the entire plant was ready to turn on steam, to make the full capacity of the plant, the next morning.

The plant contained in detail one 50-ton-capacity water tower, four ice tanks of 25 tons capacity each, two 50-ton ammonia condensers (one was used as a forecooler), two Babcock & Wilcox boilers; three return tubular boilers, all connected with Murphy furnaces, one 50-ton latest type Henry Vogt Machine Co.'s absorber, together with traveling cranes, light machinery, reboilers, skimmers, oil collectors and all apparatus contained in ice plants of the latest type. There was also an entire machine shop, complete, with power, shafting, lathes, drill presses, pipe-cutting machines, forge, emery wheel, etc.

It is the intention of the owners to rebuild the plant and replace it in its former condition, which, it is estimated, will cost about $48,000. This is to be done at once, and it is expected to have the plant running again by July 1, 1900. The insurance carried on the plant amounted to $32,500.

FIRE AND ACCIDENT RECORD.

——The ice houses of the Knickerbocker Ice Co., of Chicago, at Batavia, Ill., were burned April 29. There were about 20,000 tons of ice in the houses.

——Fire at Laurel, Pa., on the 2d ult. destroyed the ice houses of the Low Ice Co., of Carlisle, Pa. Buildings and contents were valued at about $25,000.

——The abattoir and cold storage plant of Chas. Swanson & Son, near Sacramento, Cal., was entirely consumed by fire May 5. Loss estimated at about $48,000. Not insured.

——Emmet F. Slade's ice houses on the Mohawk river, near Cohoes, N. Y., were burned May 17. The houses contained about 11,000 tons of ice. Loss, $12,000; insurance, $5,500.

——Two large ice houses near Richmond, Me., belonging to the American Ice Co., were burned on the 15th ult. The houses contained 40,000 tons of ice. Loss on buildings and tools given as $60,000, and on ice, $40,000.

——The Mausert ice house, Clarksburg, Mass., the property of the People's Ice Co., of North Adams, was destroyed by fire last month. It contained 6,000 tons of ice. Supposed to have been set on fire by boys playing with matches.

——Fire in the wholesale market and provision store of Irwin Bros., at Chicago, May 24, caused damage estimated at about $10,000. Four drums of anhydrous ammonia in the cold storage department were destroyed.

——While placing a condenser at the Cooke Brewing Co.'s plant at Chicago, F. McGovern, an employe of the De La Vergne Refrigerating Machine Co., was killed by collapse of a portion of the roof, carrying the condenser with it.

JULIUS G. ESSELBORN, DECEASED.

JULIUS G. ESSELBORN, late president of the Portsmouth Brewing and Ice Co., of Portsmouth, Ohio, died at his home in that city on May 6, 1900, of valvular disease of the heart.

Mr. Esselborn was born in Duerkheim, Germany, in 1835. In 1850 he came to America, first securing employment in New York city, where he remained until 1865. About this time he went to Cincinnati, Ohio, and engaged in milling. In 1889 he bought the Portsmouth brewery, at Portsmouth, Ohio, and in 1890 built the ice making plant, which was enlarged from time to time, until its present capacity is fifty tons of ice daily.

THE LATE JULIUS G. ESSELBORN.

Mr. Esselborn was noted for his enterprise and his public spirit, having been at the head of many movements for the betterment of the conditions in the city where he lived. He was a member of the Elks lodge, which conducted the funeral ceremonies. The body was taken to Cincinnati for cremation.

OBITUARY.

——John B. Collier, for many years the leading ice dealer of New Brunswick, N. J., died there May 15, mourned by a host of friends and acquaintances. He was a unique character, never wearing either collar or necktie, but it is said of him that for twenty-five years he had supplied every charitable institution in New Brunswick, every orphanage and even the public library, churches and Y. M. C. A. rooms with ice free of cost, and all of his drivers were under standing orders to report at once any cases of sickness or poverty along their routes in summer time; and to all such Mr. Collier would supply ice without charge.

——Peter Diemer, a pioneer ice dealer of Cleveland, Ohio, died at his home in that city May 13. He was born in Germany in 1827, coming to this country with his parents at the age of fourteen. In 1847 he started the Lake Erie Ice Co., with which he continued his connection until about a year ago, when he retired because of old age.

TROUBLES OF TRUSTS.

THE recent trouble of the Crystal Ice Co., of San Antonio, Tex., which was ordered to be closed out by a receiver because of a decision under the Texas anti-trust law, may find its counterpart, on a larger scale, in the troubles of the American Ice Co., of New York and other places. At the initiative of the New York *Journal* proceedings were begun in the Jefferson Market police court against the officers of the American Ice Co. for violation of state law. At the same time application was made to the attorney general of the state for proceedings to have the certificate under which the American Ice Co. does business in the state of New York annulled. The case is brought under chapter 267 of the laws of New York, adopted in 1896, as follows:

Every corporation, or officer thereof, that shall make any contract, arrangement or agreement, or shall enter into any combination or conspiracy for the purpose of restraining or preventing competition in the supply or price of any article or commodity in common use in this state, or with the intent to restrict or restrain trade or commerce in this state, or that shall attempt or actually conduct any business in this state pursuant to any such contract, arrangement, agreement or combination, wherever the same may be made, or shall in any manner in this state engage or aid in carrying out or executing the agreements contained in any such contract or arrangement, wherever the same may be made, shall be deemed guilty of a misdemeanor.

The attorney general, in deciding to begin action against the company, said: "Upon a careful consideration of the petition, affidavits, arguments and all the papers submitted, I am satisfied that the American Ice Co. is an unlawful combination, conducting its business in restraint of trade, in violation of law and against public policy."

The application for hearing in the police court recites the consolidation, on March 11, 1899, of the New York, Knickerbocker, Consumers', Montauk, Standard, Continental, Hygeia, Crystal Lake, Union, New York, Yonkers City, Ridgewood and other ice companies, which previously had been independently engaged in manufacturing, dealing in and selling the article of necessity known as ice. By this consolidation it is declared that the companies unlawfully conspired to monopolize the business, "with the view of crushing out all rivalry and competition in said business, and to hinder, obstruct and prevent other persons from engaging in the said business, and prevent competition therein as between themselves and individually and others engaged in the said business, and to continue and maintain the price of the said commodity at such figures as they might arbitrarily establish, and to create and carry out restrictions in the trade of manufacturing, harvesting, gathering, buying and selling of the said commodity, and establish an unlawful monopoly therein."

It is claimed that the American Ice Co. owns 118 ice houses, thirty-two ice factories and 112 bridges; that it has long term leases on twenty-six ice houses and on twenty-one ice plants; that it practically controls the sale of ice in New York, Brooklyn, Philadelphia, Canada, Atlantic City and Lakewood, N. J., and at Baltimore, Md.; that the total output of the company is 4,500,000 tons of ice a year.

The officers of the company, against whom the charge of conspiracy is made, are: Charles W. Morse, president; John D. Schoonmaker, of Kingston, N. Y., vice-president; John T. Sproull, treasurer, and Robert H. Scott, secretary. Directors: Charles W. Morse, John D. Schoonmaker, James McCutcheon, William H. Gelshenen, Orin Dennett, J. Manchester Haynes, Augusta, Me.; D. W. Hunt, Philadelphia, Pa.; Charles B. Church, Washington, D. C.; Wesley M. Oler, Baltimore, Md.; Frank K. Sturgis, Thomas Sturgis, Charles T. Barney, Alfred W. Hoyt, John R. Bennett, New Jersey, and Harry F. Morse.

Meanwhile, consumers' co-operative ice companies, municipal ice plants, labor union ice plants, *et al.*, threaten to add to the troubles of the trust.

IN giving a reason for the advance in the price of ice in New York city, the *Ice Trade Journal*, which is the official organ of the American Ice Co., says:

The total house capacity on the Hudson river is about 4,250,000 tons. The harvest of the past winter on the Hudson and Mohawk was 1,430,670 tons, or about one-third of a supply. This is not enough for the normal demand, and any ice brought here by boat or rail from places other than the Hudson costs so much more than the Hudson ice that an increased price over the bridges and to families is at once necessary. The same is true of the only other source of supply, the artificial plants. Their product is so much more costly that it becomes necessary to advance the price on the streets as soon as it necessary to use it in large quantities to supply the deficiency in natural ice.

The total possible output of the twelve ice plants now in operation in this city is about 800 tons per day, or if worked every day in the year, 292,000 tons per year. As a matter of fact, these plants do not work anything like every day in the year, and the only amount available now is that produced from May 1 to November 1, or about 150,000 tons if every plant worked every hour. Ice plants, as a rule, do not produce within 10 per cent of their maximum capacity, and, as a result, if the dozen plants produce 140,000 tons they will do well.

When brought from a distance, and especially when delivering in small lots, a considerable item is the meltage. An ice man in New Haven, Conn., thus sums up the cost of ice brought thither from Maine, assuming cost there to be $1.50 per ton:

Cost of 10,000 tons at $1.50 per ton	$15,000
Loading 7,000 tons at 15 cents per ton, 30 per cent being shrinkage in the house	1,050
Freight on 7,000 tons at 75 cents per ton	5,250
Discharging 4,900 tons at 15 cents per ton, 30 per cent being shrinkage on vessels	735
Delivering 4,165 tons at $1.56 per ton, 15 per cent being shrinkage on wagons, etc.	6,497
Total	$28,532

We have 4,165 tons to sell, which have cost us $28,532, or $5.65 per ton. This ice then must be sold to average not less than $5.65 per ton to get back simply the cost.

The American Ice Co. estimates the meltage from the field to the consumer at 40 to 50 per cent of the harvest.

BACK NUMBERS WANTED.

BACK numbers of ICE AND REFRIGERATION, for the months of January, March, April, June, September and December, 1899, are desired. If any subscriber, who is not keeping files of the papers, will send us copies for any of the dates named he will be credited as many numbers on his subscription.

ANSWERS TO CORRESPONDENTS.

SIZE OF MACHINE REQUIRED FOR GIVEN WORK—TEMPERATURE OF AIR SPACE IN INSULATED WALL—ICE VS. MACHINE COLD STORAGE—TROUBLE WITH COMPRESSOR.

[This department of ICE AND REFRIGERATION is conducted for the benefit of the trade generally, as well as individuals; and all competent inquiries will be given timely and proper attention, precedence in all cases being given to such questions as are of general rather than of individual interest. Correspondents will please write only on *one* side of the sheet. Persons desiring to communicate with correspondents using this column will do so by addressing them in care of ICE AND REFRIGERATION, 177 La Salle street, Chicago. All communications to this column are treated as confidential, and the names of the writers will not be disclosed without their permission. Anonymous communications will not be answered in this column.—ED.]

SIZE OF MACHINE REQUIRED FOR GIVEN WORK.

To the Editor: Please give me the size of a refrigerating machine to cool 50,000 gallons of water from 90° to 60°, the number of feet of 1-inch pipe, and size of tank best suited to cool the water. D. I. C.

ANSWER.—The size of the refrigerating machine required for this work depends on the time within which you desire to cool the water, and also on the temperature at which you desire to allow the ammonia to expand, in order to produce the refrigeration. Assuming that you desire to cool the said amount of water in twenty-four hours, and that you desire to expand your ammonia at a back pressure of fifteen to twenty pounds, you will require a refrigerating machine of fifty tons capacity, commercial rating. If, however, you can manage to expand your ammonia at a back pressure of seventy-five pounds or more, a machine of twenty tons so called commercial capacity may be made to do the work. If the cooling of the water is to be done in twelve hours, the sizes of the machines are to be doubled, other circumstances being equal. The size of piping, etc., also depends on the back pressure, the time of cooling and the manner in which you desire to cool (if by direct expansion or by brine) and whether the water to be cooled or the ammonia or brine are to be circulated through pipes, while the other material is contained in a tank.

TEMPERATURE OF AIR SPACE IN INSULATED WALL.

To the Editor: Would you kindly favor us with information at what ratio the temperature decreases per inch in a room that is constantly kept at 20° F., insulation consisting of charcoal inclosed in brown paper and two boards, making a total of seven inches, and then an air space of an inch and a half, and then a wall of two feet, the temperature outside being from 50° to 60°? I looked in your compendium, but did not come across any information. It is most important for me to know, as I am only a tenant in the place where I am. I would not like to have any troubles with the landlord through frosting the walls, and thus making them crack, perhaps, the walls being alternately frozen and thawed. Meantime, I have an idea that even at 20°, with the insulation that is above described, there will be no frost in the air space between the wall and the insulation. Kindly say if I am right in this, and how close, and I suppose that when I keep the temperature at 24° it will mean that right through the insulation there will be 4° less cold. W. W.

ANSWER.—On page 181 of Compend you will find the following passage: "An air space sealed up hermetically between two walls has the average temperature of the outside and inside air." Applying this to the air space in the insulating wall described in this letter, its temperature would be—

$$\frac{20 + 50}{2} = 35° \text{ F.}$$

If the temperature outside of brick wall be 60°, the temperature of air space would be 40° F., and if the temperature be 24° and 50°, it would be 37° F. This is on the supposition that the air space is sealed up hermetically on both sides—that is, practically so. If this is not the case, the temperature of the air space or of the brick wall depends on the relative amount of heat leakage through the brick wall and through the insulating wall. From the figures given in the Compend, page 178, etc., on relative heat leakages, it may be inferred that the heat leakage through the brick wall is at least equal to that through the insulating wall, and on this basis we reach the same result as above, in accordance with which the temperature of the air space will not be below the average of the inside and outside temperatures. For the figures given by you for the ruling temperatures this average is always above the freezing temperature, and therefore no frost can form on the brick wall under the conditions mentioned by you.

ICE VS. MACHINE COLD STORAGE.

To the Editor: We contemplate building a cold storage house in connection with natural ice, if we find it to be practicable. We shall do this in competition with an artificial ice and cold storage plant, providing we can do so to advantage. We already have a large brick building with 20-inch walls much too large for what we shall probably require, but it occurs to us we can, in this, build a plant that will nicely do the work, if, as said before, it is practicable. What we wish to know is how cold storage produced in this way would compare with that produced artificially. P. I. C.

ANSWER.—The question as to whether a natural ice cold storage house can be successfully operated in competition with a mechanically refrigerated house or not depends, first, upon the cost of the natural ice, and, second, upon the application of the refrigeration. Natural ice stored above cold storage rooms will not produce a temperature much below 40° F. —say 36° as a possible minimum—while if the ice is melted with salt, and the refrigeration is applied by circulating cold brine through a system of pipes located in or above the cold storage rooms, temperatures as low as desired can be maintained, say to a minimum of 5° above zero F., and the air in the rooms would be much drier and purer with the pipe surface system of refrigeration than with the ice stored above the rooms. Provided the rooms are properly constructed and insulated, it can be safely estimated that each twelve thousand (12,000) cubic feet to be refrigerated will require one ton (2,000 pounds) of ice melting each twenty-four (24) hours. From this basis you can readily estimate the cost of operating any required size of building—where the ice and salt system is used. The basis of calculation is one pound of salt to two pounds of ice. So in making an estimate the cost of salt, as well as the cost of ice, must be considered.

TROUBLE WITH COMPRESSOR.

To the Editor: I would like to have you explain, if possible, through your columns or otherwise, a peculiarity which I have met with in the operation of our direct expansion refrigerating system. The compressor is an 8×12 horizontal, double-acting, direct connected machine with water jacket around cylinder. Condenser has 1,500 feet of 1-inch pipe made up in three spiral coils with manifold connections top and bottom, and is of the atmospheric type, half inch liquid pipe and about 6,300 feet of 1-inch expansion pipe, divided into nine expansions, although we are never able to run more than seven expansions at one time. The peculiarity was this: With 165 to 180 pounds condensing pressure we were unable to

hold any frost on the expansion coils with less than twenty-two pounds suction pressure, our suction pressure usually being twenty-eight to thirty pounds.

In case we would close one or two expansions so that the suction pressure dropped below twenty-two pounds, we would immediately lose the frost from the whole system. We usually run about eleven hours per day, and at the time of shutting down the system for the night we would experience the same thing. As soon as the gas was pumped off the low pressure side below twenty-two pounds, we would lose the frost, which would melt off the system in about two minutes. While these conditions existed the expert who erected the plant was here, but was at a complete loss to know the cause, as there was plenty of liquid ammonia in the receiver at all times, by-pass valves perfectly tight, and all the conditions about the plant seemed to be correct. However, we placed another compressor in place of the first one, of the same speed and dimensions, and had no further trouble, although using the same ammonia and all conditions being the same. Can you say what was the trouble? M. H. M.

ANSWER.—If we put the correct interpretation on your communication, viz.: that you have removed the original compressor from your premises and replaced the same with one of exactly the same diameter and stroke, and operated at the same piston speed, then there can be no doubt that the original compressor must have been defective in some way, resulting in a failure on the part of the compressor to properly perform its functions of exhausting the ammonia gas from the expansion coils. Such a defect should, however, have been easily discovered and promptly rectified by any competent engineer, particularly by the expert who erected the plant, and was present when the peculiar conditions existed. If, on the other hand, you did not remove the original compressor, but added a duplicate compressor to your plant, and now have two compressors running in connection with the expansion coils, we can readily account for the improved conditions of operation by the fact of increased compressor displacement, and the further fact that with two suctions working on the expansion coils (supposing the suction of your machine to be 2-inch extra strong pipe, the proper size for an 8-inch compressor), the combined area of the two suctions would nearly equalize with the combined area of the nine openings from the expansion coils to the suctions, while with only one compressor, with 2-inch suction pipe, the nine suction openings would be double the area of the 2-inch suction pipe. To illustrate: The area of a 1-inch extra strong pipe is .71 square inches; nine 1-inch pipes would be 9×.71, or 6.39 square inches, while the area of a 2-inch extra strong pipe is 2.935 square inches. You will readily appreciate that the 2-inch suction pipe would be capable of carrying the gas away only from less than one-half of the expansion coils; in other words, less than one-half of the expansion coils would produce all the gas the suction pipe is capable of carrying to the machine. With two 2-inch suctions operating on the coils the areas would be more closely equalized, although not entirely so, and the circulation of the gas would, in consequence, be more uniform throughout the system.

You say you have 6,300 feet of 1-inch expansion pipe, divided into nine expansions (or you might say, nine coils). This would average 700 feet of 1-inch pipe in a run, which we would consider a short travel of gas on a direct expansion plant. If you had the pipe divided into four expansions (or coils) you would only have four openings from the coils to your suction pipe, which would give a combined area of 2.84 square inches, just a little less than the area of the suction pipe, and the entire system would operate uniformly, as there would be a steady and uniform flow of gas throughout the system. As the connections are now made (when operating only one compressor), there must be a backing up of gas from part of the coils to the other part, and the regulation of the expansion valves must be reduced to a fine art to secure anything like satisfactory results with the plant; in fact, we do not see how it is possible to keep a uniform circulation of gas in the system, under conditions of varying temperature resulting from running and starting up, with the connections as described by you, and only one compressor in operation.

Again, we would suggest that your condenser is small for the compressor. With the compressor operating 100 revolutions per minute, which we would consider a safe speed for that size of compressor, the capacity of the plant would be about seventeen tons of refrigerating (ice melting) capacity. Figuring on an allowance of 150 feet of 1-inch extra strong pipe per ton of refrigerating capacity, which is about the average allowance for atmospheric condensers on first-class plants, would make the total of a condenser suitable for your compressor, 17×150 or 2,550 feet of 1-inch extra strong pipe, when operating the plant to its maximum capacity, which we should consider to be the proper basis of construction of a condenser. You, however, say that you have only 1,500 feet of 1-inch pipe in the condenser; we say, therefore, that your condenser is small, smaller than we would care to have a condenser operated in connection with an 8×12-inch double-acting compressor.

About the frost melting off your pipes when the plant is shut down, this is a matter that depends entirely upon the temperature of the rooms. If the rooms are warm, above 32° F., the frost will melt off the pipes very rapidly after the machine is shut down, while if the temperature of the rooms is lower than 32° the frost would remain on the pipes for a considerable time, or until the temperature of the rooms rose above 32°. You, of course, understand that when a direct expansion plant is shut down the refrigeration ceases instantly, excepting in so far as the melting of the frost from the pipes performs a refrigerative effect on the temperature of the rooms.

The fact that the frost would suddenly melt off the entire system when the expansion valve was opened a little too far, might be owing to two reasons; first, flooding the expansion coils with warm liquid from the condenser if the system contained a considerable charge of ammonia, and, second, blowing hot gas from the condenser into the expansion coils if the system was short of liquid. We would be inclined to make a careful examination of the connections leading from the liquid receiver to the expansion coils. If the outlet pipe from the receiver extended too high up into the receiver, projecting above the liquid line in the receiver, it would be possible to blow hot gas from the condenser to the expansion coils even when the receiver showed a partial charge on the gauge.

REFRIGERATION ABROAD.

EXTENSIVE IMPORTS OF EGGS AND POULTRY INTO GREAT BRITAIN—FROZEN POULTRY—LACK OF REFRIGERATOR CARS IN IRELAND—MISCELLANEOUS FOREIGN ITEMS.

IN a paper read before the Société Nationale d'Agriculture de France by M. de Loverdo, the author calls attention to the heavy importation of eggs and poultry into Great Britain. The eggs imported into Britain last year numbered 16,000,000 great hundreds (1,920,000,000), and were valued at $24,548,227, the poultry at $3,821,633, a total of $28,369,860. England is credited with but a small production of turkeys, and importations from abroad have increased enormously in late years, as the liking for turkeys is greatly on the increase in England. The British market is supplied primarily from Italy and France, Canada and parts of eastern Europe ranking next. M. de Loverdo does not mention the United States as sending poultry to this market. More turkeys are received from Italy than from France. France exports annually 60,000 turkeys, while Italy exports from 600,000 to 800,000; but the birds from beyond the Alps find their way not only to London, but to Leipzig, Dresden, Frankfort, Berlin and Hamburg, and they realize higher prices in those German towns than in England. In a comment upon M. de Loverdo's paper, United States Consul Marshal Halstead at Birmingham, England, states that, "during the last two or three years, Canada has made extraordinary efforts to establish a turkey trade in England, the greatest care being bestowed upon the transport in cold storage; but, while these Canadian birds have no lack of quality and easily attain the weight of twenty pounds, it is said the refrigeration they are subjected to does not improve the flavor of the flesh. But this complaint about refrigeration is always made in Great Britain, and I judge from the statements of those who have made a fair, honest and unprejudiced trial with refrigerated meat that chilled meat, as opposed to frozen meat, is all right if properly taken care of, if allowed to 'thaw' out slowly and not put in the oven while cold. The general objection to it here seems to be based largely on prejudice, and I believe the consumer is not aware of the difference, provided the meat is not delivered cold. . . . The butchers here claim that in meat which has been frozen, the blood vessels are found to have burst when the meat is cooked (as if that made any difference, or as if that could be recognized by the eater of the cooked meat!). The fact is, the best American meat brought to this market is sold by the butchers—so great is the prejudice against 'frozen' meat—as English meat; but it can generally be told by the smaller bones, as we kill younger cattle, while the poorer grades of English meat are often sold as American meat—and, of course, there are some very poor grades of English meat, for there is so much pedigree cattle of value too great to be killed until beyond the breeding age. It happens to be a fact at present that it is more difficult than formerly to get good meat in England, and if the statements of the butchers of Birmingham, in their recent proclamation announcing a 4-cents-per-pound increase, are to be believed, this is due to the lessening of the American supply, owing to the number of transports employed for south Africa and the amount of meat which must be shipped thither. Of course, the butchers do not confess that the decrease in the American meat supply means a decrease in the supply of good meat, though this is the fact; it has increased the demand for English meat, so that English meat is now 'too fresh.'"

ARTHUR LOUGH, managing director of the Cavan Creameries, Limited, Cavan, Ireland, at a recent hearing before the local government board, is reported to have made the statement that while there are nearly 600 creameries in Ireland making good rich Irish butter, these are hampered in their usefulness by inadequate shipping facilities during the summer months, as there is not a single refrigerator car in use on any of the Irish railways. In England the complaint of a great shortage of refrigerator cars on the railway lines becomes urgent just as soon as the season of warm weather opens, and is as regularly answered by the railway companies, that preparations for increasing the number of such cars are under way, but will not be completed until "next year."

MISCELLANEOUS FOREIGN ITEMS.

——The Woodville Freezing Works at Woodville, New Zealand, are to be converted from the compressed air to the ammonia system.

——Hollingsworth & Son, of Birmingham, England, bacon curers, have accepted plans for a considerable extension of their works, the equipment to be of the most modern character, and to include an additional Hall's patent anhydride refrigerating machine.

——Tenders for the erection, at Bad Nauheim, Germany, of an abattoir with cold storage rooms, suitably equipped to supply a city of 15,000 population, have been invited by the municipality, which reserves the right to let the contract as a whole or in sections, as the authorities may decide.

——The municipal authorities of Buda Pesth, Hungary, are preparing to build extensions to the public abattoirs, which have become notoriously insufficient to meet the city's needs. The estimates include an allowance of 330,235 crowns (about $66,000) for cooling chambers, refrigerating machinery, boilers, etc.

——The markets committee of the town council of Wolverhampton, England, has decided to recommend the construction of cold stores and an ice making plant in the new market buildings to be erected on the north side of Wulfruna street. The amount necessary for the erection and equipment of the stores is estimated at £9,450.

——The total shipments of frozen meats from Auckland, New Zealand, last year were, according to the *News* of that city, equivalent to 20,000 carcasses of sixty pounds each. This season, up to May 1, double this quantity had already been shipped, and it was expected that the season's shipments would reach nearly 100,000 carcasses.

——Extensive cold stores and a plant for the manufacture of ice are to be erected shortly in Dublin, Ireland, by the Dublin Ice Co., controlled by M. J. and William McCabe and Arthur Hanlon. The plans include several large buildings, five stories in height, to provide about 500,000 cubic feet of cold storage space, and an ice plant capable of producing twenty-five tons of ice daily. The new plant is to be upon the property known as the Warren Mount Mills, and it is proposed to utilize the mill pond adjoining for the production of some ninety horse power for driving the machinery.

——When the first parcel of forced strawberries arrived at Covent Garden, London, England, they sold for twenty-four shillings per pound, and in some cases fetched two shillings sixpence an ounce. But these remarkable prices came down with an astounding rush, to very nearly as many pence per pound as a few weeks ago they were shillings. The collapse is due to competition of such fruit dainties as Williams pears, plums, peaches and nectarines, which are arriving in great quantities from the Cape, and which are preserved in all their pristine loveliness by the aid of marine cold storage.—*Ice and Cold Storage.*

——The great extent to which cold storage is now used in this country will be better appreciated when it is called to mind that there are now no less than nineteen frozen meat stores in London alone, having a total capacity of 6,000,000 cubic feet, while in twenty-six of the provincial towns there are forty-seven frozen meat stores with a combined cubic area of about 8,000,000 cubic feet. These stores are capable of holding, when quite full, nearly 4,000,000 carcasses of sheep. Each year the provision of refrigerating accommodation is becoming more

and more a necessity, and it may be confidently expected in the near future that every provincial town of any size at all will be provided with a cold store for the use of the local tradesmen and the neighboring farmers.—*British Refrigeration.*

——The British admiralty have recently ordered refrigerating machines from J. & E. Hall, Ltd., of Dartford, England, for H. M. S. *Leviathan, Good Hope, Drake* and another war ship. The Peninsular and Oriental Steam Navigation Co. have also intrusted to Halls the fitting with refrigerating appliances of their four new ships, now building. Among other ships that this company has recently received orders to fit with refrigerating machines are the S. S. *Astoria*, for the Anchor Line; the S. S. *Duke of Norfolk*, for J. B. Westray & Co.; two more ships for the Netherland Steamship Co., and the S. S. *Corinthian*, for Messrs. J. & A. Allan.

——Muehlhaus, in Alsace, Germany, is to have a cold store, and sent a committee on a tour of inspection. Karlsruhe, Munich, Nuremberg and Frankfurt were visited. Karlsruhe employs carbonic acid, and maintains a normal temperature of +3° C. Chambers are let at forty-eight shillings per square meter per annum. Munich uses ammonia plant, the temperature being kept at + 2° C., and charges fifty shillings per square meter per annum. Nuremberg uses ammonia, and charges twenty-five shillings per square meter per annum, although it costs the authorities fifty-two shillings. Frankfurt's rate is thirty-two shillings, ammonia being the cooling agent.—*Ice and Cold Storage.*

——The refrigerating installations for what are stated to be the three largest meat carrying steamers afloat, the *Suffolk, Norfolk and Sussex*, their meat carrying capacity being 130,000 carcasses of mutton, dairy produce, etc., each, have just been completed by J. & E. Hall, Limited, of Dartford, England, the owners of the first two steamers being Messrs. Birt, Potter & Hughes, and Messrs. Wm. Milburn & Co. of the latter ship. The refrigerating machines, which are on Hall's dry air carbonic system, are placed entirely in the main engine room, where the nature of the refrigerant used can, under no circumstances, become a source of trouble. The machines also come under the attention of the engineer on watch, and do not occupy useful space in any other part of the ship.

THE BRITISH ICE ASSOCIATION.

THE first annual meeting of the British Cold Storage and Ice Association was held May 4, at Examinations hall of the Royal Colleges of Physicians and Surgeons, in London, England. The secretary, Mr. R. M. Leonard, announced that the president, Hon. Alan de Tatton Egerton, M. P., was prevented by parliamentary duties from attending. Letters of apology were also read from Vice-Presidents B. Godfrey, Sir A. Seale Haslam, T. B. Lightfoot and L. Sterne, as well as from Mr. J. Wemyss Anderson and others who had been invited to attend. A letter from Mr. W. J. Rushton, of Birmingham, Ala., president of the Southern Ice Exchange, was read as follows:

> I note with satisfaction the organization of associations that bring together members of the ice trade, and tend to reduce the friction so prevalent in that line. We have found great advantage in the meeting of manufacturers and the understandings arrived at that could come only from the effect of personal contact, and the general good feeling engendered thereby. The Southern Ice Exchange does not make prices or seek to control them, but works under the revised "Golden Rule"—"Do not ship into others' territory at prices lower than you would sell the same quantity in your own." I wish your association a grand success.

Mr. P. Gaskell, of Hull, was elected chairman, and papers were read by Mr. G. Halliday on, "Recent Researches in Refrigeration," by Mr. W. D. A. Boston, "Insulation and Insulators," by Mr. W. B. Esson on, "Electric Lighting of Cold Stores," and by Mr. P. Gaskell on, "The Design and Construction of Buildings for Ice Factories and Cold Storage." The meeting was followed by a "dinner," with the customary accompaniments, and on the day following visits to local points of interest.

——It is reported that eastern capitalists, represented by Edward Gunster, have bought a controlling interest in the ice making plant of Granducci & Battalia at Versailles, Ky.

AN IMPORTANT DECISION.

THE United States Supreme court has recently decided a case of considerable importance in the action of the stockholders of the former Consolidated Ice Machine Co. against the De La Vergne Refrigerating Machine Co. The history of the transactions that brought on the lawsuit did not differ much from what would apply to many other similar transactions between corporations or companies or individuals. In 1890 the Consolidated Ice Machine Co., of Chicago, made an assignment for the benefit of its creditors. In April, 1891, the stockholders of the company made an agreement with the De La Vergne company, by which the stockholders of former company were to exchange their stock for stock in the latter company and agree to desist for a period of ten years from making or selling ice machines in any part of the United States except Montana. Later the De La Vergne company refused to fulfill its part the agreement, and action to compel it to do so was begun by stockholders of the defunct Consolidated Ice Machine Co. Various laws were cited to show that corporations had a right to purchase stock in other corporations, and thereby obtain control of the property of a competitor, but Justice Brown, in deciding this question in the negative, held that no subsequent legislative acts had annulled the act of 1848. The basis of the decision on this question is the familiar doctrine that the powers of a corporation created by a legislative act are limited to such as are defined in the act, and that by implication they exclude all others not mentioned. The New York act of February 17, 1848, provides that "it shall not be lawful for such company to use any of their funds in the purchase of any stock in any other corporation." Therefore the decision was against the stockholders of the Consolidated company, and will form a precedent in cases of a similar nature for the future.

AN interesting brochure on the construction of a modern bacon factory has been issued in London, England, being a reprint from an article on the subject which appeared in the Journal of the Royal Agricultural Society of England, third series, Vol. XI, part 1, 1900. The pamphlet is for private circulation only; but the journal, published by John Murray, London, is obtainable. The development of bacon curing in England is rapid, and new bacon factories are dotting the country in all directions, judging from the foreign reports. These seem to compete successfully with the imported bacon, showing that careful study of the matter, as proven by the contents of the pamphlet mentioned, is bearing legitimate fruitage.

IT is reported that a liquid air machine has been set up at the Paris Exposition buildings by Charles E. Tripler, of New York, which will have a capacity for making thirty gallons of liquefied air per hour. The location is in the main Exposition building, on the Champ de Mars. The apparatus is to be operated by two sets of double-compound engines, of 75 horse power each. Not only is the air to be liquefied and distributed liberally, but provision is to be made for operating small motor engines by power from the vaporization of the liquid air.

FROM a recent report of the dairy industry in New Zealand it appears that the introduction of mechanical refrigeration has materially assisted in bringing butter making in the front rank of the industries of this enterprising colony. Mr. Sorensen, of the agricultural department of the colony, says that if we examine "the exports of the four most important industries during the last ten years, we will find that the value of the wool exports has increased 34 per cent; frozen meat, 244 per cent; gold, 31 per cent, while dairy produce has increased 405 per cent." The chief reasons of this enormous extension are the introduction of the system of refrigeration in the colony and in the steamers, the settlement of the bush districts, the factory system and the co operative movement. The assistance and the guidance provided by the government have also been useful. The state of affairs in regard to the dairy industry within the Auckland province is declared to be very satisfactory, an increase of about 50 per cent over last year's production being apparent, which doubtless would have been still further increased but for the very dry weather of last summer. The exports of butter from the port of Auckland alone for the seven months ending December 31, 1899, are valued at £39,467 ($197,335).

CREAMERY ITEMS.

——Mulkey Bros., of Sheridan, Ore., are organizing a company to build a creamery plant.

——J. F. Stoops, of Faulkton, S. D., proposes to build and operate a creamery plant, to cost about $3,000.

——The plant of the Gladwin Creamery and Cheese Co., Gladwin, Mich., recently destroyed by fire, is to be rebuilt.

——The Silver Springs Creamery Co., of Bevans, N. J., has been incorporated, with a capital of $6,000. Corporators: E. E. Smith, F. McKeeby, E. T. Roe, V. E. Bevan, all of Bevans; N. Tillman, N. Depue, of Wolpock Center.

——The Grant Creamery Co., to engage in the manufacture of butter near Storm Lake, Iowa, has been incorporated, with an authorized capital stock of $10,000, divided into $10 shares. Officers: President, M. L. Soeth; secretary, A. J. Treman, and treasurer, S. A. Treman.

——The North Washington Farmers' Creamery Association, of North Washington, Chickasaw county, Iowa, has filed articles of incorporation with the secretary of state. Its capital stock is limited to between $25,000 and $35,000. George Marion is president of the company, and F. N. Gendorff, secretary.

——There are 1,000 creameries and 1,600 cheese factories in Wisconsin. The state produced 100,000,000 pounds of butter and 64,000,000 pounds of cheese last year. The butter was valued at an average of twenty cents a pound, or $20,000,000, and the cheese over twelve cents, or $5,000,000. The value per pound may be overestimated, but it approaches the total valuation, and likely the actual production exceeds the estimate.—*Creamery Journal.*

——Probably Cambridge, England, is the only place in the world where one would be likely to find butter sold by lineal measure; but there, in accordance with the old custom, it is literally sold by the yard. For generations it has been the practice of Cambridgeshire dairy folks to roll their butter into lengths, each length measuring a yard and weighing a pound. Deftly wrapped in strips of clean, white cloth, the cylindrical rolls are packed into long, narrow baskets made for the purpose, and thus conveyed to market. The butter women, who in white linen aprons and sleeves preside over the stalls in the mart, have no need of weights or scales for dispensing their wares; constant practice and an experienced eye enable them with a stroke of the knife to divide a yard of butter into halves or quarters with almost mathematical exactness.

EFFECT OF GERMANY'S NEW MEAT BILL.

THE much talked of German meat inspection bill which passed the Reichstag May 23, will not affect the packers of the United States as seriously as it will the meat trades of the neighboring continental countries. From statistics collected by the London *Times*, it appears that the entire import of dead meat into Germany for 1899 amounted in value to $17,800,000, $2,700,000 less than in 1898, although still a great increase over 1897. The imports of fresh beef amounted to 395,000 cwt., and of fresh pork 217,000 cwt., mostly supplied by Denmark, Holland, Russia and Austria. The United States supplied of pickled and salted beef, 31,500 cwt., pickled pork, 135,000 cwt.; hams, 62,000 cwt.; sausage meat, 71,500 cwt.; canned meats, 50,000 cwt. The United States also sent 335,000 cwt. of bacon and 2,250,000 cwt. of lard, but these two articles are excluded from the scope of the measure, so that the practical or partial exclusion will effect a total of about 335,000 cwt. of packing house products. The amendments that have been made to the bill, which permit the import of pickled meat "when its origin and the manner in which it is preserved are known by experience to exclude all danger to health," etc., may offer a loop hole through which American pickled meats may pass inspection and secure a market in Germany. The Berlin *Boersen Zeitung* of April 11, in a lengthy review of the German import trade, states that Germany needs but from 20,000,000 to 28,000,000 marks ($4,760,000 to $6,664,000) worth of outside meat yearly, a mere bagatelle as compared with her imports of other goods. The last official report of the United States treasury department gives the total value of all the canned beef exported from the United States to Germany for the fiscal year ending June 30, 1899, as $294,123, and of pickled beef, $305,146; of pickled pork, $824,019; of hams, $903,010, a total of $2,326,297. During the same period the exports of lard to Germany were valued at $13,600,767; of bacon, at $2,520,225; of lard compounds, $314,092; of sausage casings, $710,307 and of all other meat products, $1,268,950. What proportion of this will be cut off through this new bill remains to be seen.

FROM a table published in the London *Meat Trades' Journal* it appears that the total imports of fresh beef into the United Kingdom for the year 1899 amounted to 3,802,622 cwts., of which total 2,756,796 cwts., or 72.5 per cent, were imported from the United States. The imports of mutton aggregate 3,446,022 cwts., of which 2,001,452 cwts. came from Australasia, 1,141,208 cwts. from Argentina, 284,886 cwts. from Holland and 18,476 cwts. from other countries. The imports of pork are given as 668,972 cwts., of which 379,688 cwts. came from Holland and Belgium, and 668,972 cwts. from other countries. Of the total amount of live stock imported during 1899, which is given as 503,504 cattle and 607,755 sheep, 321,229 head, or 63.80 per cent, of the cattle and 121,030, or 19.92 per cent, of the sheep came from the United States. The value of the fresh beef imported is given as £7,344,723, as against £5,915,615 for 1898. The total value of beef, mutton and pork imported is given as £14,187,171, against £11,983,098 for 1898.

NATURAL ICE NOTES.

——The Lincoln Ice Co., of Chicago, has certified to an increase of capital from $5,000 to $40,000.

——H. C. Black & Co., of Greenfield, Mass., ice dealers, who succeeded W. P. Maynard in 1897, have sold out their plant and business to Geo. H. Wright & Co.

——The Watch City Ice and Fuel Co. is the name of a new company doing business at Waltham, Mass. The new company will get its ice from New Hampshire.

——The Pittston Ice Co., of Pittston, Pa., has purchased the plant and property of the Moosic Ice Co. The plant at Moosic will be retained, and also new ice houses erected at Taylor.

——Herman Orth, of Harrisburg, Pa., has purchased the ice house, together with its contents, 6,000 tons, of H. W. Snyder, on Swatara creek, near Middletown. The price paid is given as $10,000.

——The ice firms of L. C. Bodwell & Co., Manchester Coal and Ice Co., Amoskeag Ice Co. and Stearns Bros., at Manchester, N. H., have combined and issued a uniform card of rates. Prices are not increased, but it is said there will be no rate cutting.

——The National Ice Co., organized recently at Cincinnati, Ohio, by "Royal Arch" members, a society of saloon keepers, to compete with the Ice Delivery Co., has begun delivering ice at twenty cents per 100 pounds. A warehouse has been leased on the canal near Elm street, and ice will be received from Sandusky, Ohio.

——A new ice company, to be known as the Hartford Co-operative Ice Co., has been organized at Hartford, Conn., with C. L. Palmer, G. F. Kellogg, P. S. Kennedy, A. A. Pocock, C. D. Strickland and P. M. Preston as directors. The company is composed largely of market men, grocers and hotel men, and proposes to buy and sell ice, underselling the companies now supplying ice. It is also proposed later on, or next season, to increase the capital stock and erect and operate a plant for the manufacture of ice. The present capital is $10,000.

——By purchase the Boston Ice Co., Boston, Mass., has secured possession of the Drivers' Union Ice Co., of Wakefield, Mass., which had a paid up capital stock of $100,000, thereby adding the Wenham lake, the Chebacco lake at Hamilton, Lovell's pond at Sanbornville, N. H., and Lake Washakum at South Framingham to its large holding of ice rights. Before the consolidation the Boston Ice Co. controlled fields at Milton, N. H.; Newton Junction, N. H.; Sandy pond, Ayer; North Chelmsford, Wakefield, Woburn, Sharon Heights and Great pond at South Weymouth.

COMPANY ELECTIONS.

——The Hartford Co-operative Ice Co., of Hartford, Conn., has elected as its first officers: President, C. L. Palmer; vice-president, George F. Kellogg; treasurer, T. F. Cannon; secretary, Leo Guethlein.

——The Consumers' Ice Co., Chester, Pa., May 17 elected officers as follows: President, W. J. McClure; vice-president, G. L. Horning; secretary, Harry E. Bloom; treasurer, Harry Abbott; William Green, manager. Directors: James T. Burke, G. L. Horning, John C. Kepner, John J. Evans, John McGolrick, H. G. Mason, W. J. McClure, Michael Cronin, Hugh McCaffery, David B. McClure.

——The St. John Ice Co., St. John, N. B., recently organized, has elected W. O. Purdy, president; J. Fraser Gregory, vice-president; James Jack, secretary-treasurer; L. G. Crosby, J. V. Russell, J. D. Seely and D. J. Purdy, directors.

PACKING HOUSE NOTES.

——Swanson's slaughter house and cold storage plant, near Sacramento, Cal., was damaged $30,000 by fire recently.

——D. H. Good, formerly of Marion, Kan., is arranging to build a packing house plant at Carthage, Mo., to cost between $10,000 and $20,000.

——The Palestine Packing Co., of Palestine, Tex., is enlarging its plant and putting in new machinery. A cold storage house will also be built.

——The Rochester (N. Y.) Packing and Cold Storage Co. has been formed, with a capital of $60,000. Directors: John Schroth, Greece; George Bohnrer, Rochester.

——The Dold Packing Co., at Wichita, Kan., is about to erect and equip a new building, to be used for cooling purposes. The proposed improvement will cost, it is stated, about $150,000.

——Messrs. Ninemire & Morgan, of Aberdeen, Wash., are preparing to erect stock yards and a slaughtering and packing house plant in that city, which is to include also a large cold storage apartment.

——The Boise Butcher Co., at Boise, Idaho, has built and equipped a modern wholesale market and packing house, provided with refrigerating machinery, said to be the first to be introduced in the state. The plant, it is stated, was put up at a cost of over $10,000.

——The Robbinstown Packing Co., Robbinstown, Me., has been organized and incorporated, with a capital stock of $10,000, to can and pack sardines. The officers of the new company are: L. E. Holmes, of Robbinstown, Me., president; George H. Hunt, of Calais, Me., treasurer.

——The proceedings in bankruptcy against the firm of J. P. Squire & Co., doing business in Massachusetts, but incorporated under Maine laws, has been argued in the latter state. The majority of the creditors favored reorganization instead of bankruptcy, and it is proposed to form a new company to acquire all the assets and assume all the liabilities of the old corporation, the creditors to accept stock in the new corporation for their claims.

MINOR LEGAL NOTES.

——Suit for $3,000 damages has been commenced against the Distilled Water Ice Co., of Baltimore, Md., by R. F. Mesenberg, claiming damages in that amount for pollution of the water of a little run or open stream that passes under plaintiff's place of business. It is claimed that before the ice plant was established the water of the stream was pure, but that the emptying of hot water into the stream by defendant ice company has resulted in covering plaintiff's goods with moisture, ruining them and causing unhealthful conditions.

——C. & L. Vanderbeek, ice dealers, who own property at Dundee lake and on the Passaic river, New Jersey, have brought suit against the city of Paterson, N. J., for $50,000 damages, on the ground that the city first polluted the stream and then passed a law prohibiting the sale of ice cut from the polluted stream, thus ruining the plaintiffs' business. The court of errors and appeals has decided that riparian owners have rights to the middle of the stream where the river is not navigable, and that they are entitled to pure water, and that they could maintain actions in the common law courts against riparian owners furthur up the stream, who polluted it. Under this decision the plaintiffs think they have a good case against the city.

——The ice manufacturing plant of P. H. Cooper, at Lincoln, Neb., was sold May 21 under foreclosure proceedings to Frank Wilson, representing the Arctic Ice Machine Co., of Cincinnati, Ohio, for $18,760.

DEC.—HERE ENDS MY BOTHER FROM THIS BEAST, SO!

JUNE.—"BUT THE CAT CAME BACK."

THE following memoranda of projected ice factories and refrigerating plants, or of those in course of construction, and of improvements and betterments in existing plants, have come to our notice during the past month:

ALABAMA.

Montgomery.—The People's Ice and Cold Storage Co. has been organized in this city for the purpose of erecting and operating an ice making and cold storage plant. Contract has been placed with the York Manufacturing Co., York, Pa., for a complete 30-ton ice making plant (can system), together with the necessary piping for the cold storage rooms. The plant will be erected at once.

New Decatur.—Scruggs & Echols, who now supply this city and neighborhood with lake ice, intend, it is stated, to erect a plant for the manufacture of ice later.

ARIZONA.

Globe.—Alfred Kinney is enlarging the capacity of his ice making plant, and will have installed, it is stated, a 15-ton ice machine, furnished by D. L. Holden, of Philadelphia.

ARKANSAS.

Clarendon.—The Clarendon Electric Light and Ice Co. has been organized and incorporated, with $10,000 capital, by J. S. Thomas, president; M. J. Manning, vice-president, and Ike Bondi, secretary, and will erect and operate, it is stated, an electric lighting and an ice making plant.

Yellville.—A plant for the manufacture of ice is being erected here.

CALIFORNIA.

Hanford.—A company is being organized to have a capital of $25,000 and to erect and operate a plant for the manufacture of ice and for cold storage purposes. The stock is being placed by popular subscription.

Mariposa.—W. N. Ten Eyck, whose proposed ice making plant was mentioned in last month's ICE AND REFRIGERATION, writes that considering cost, etc., it has been decided that circumstances would not warrant the expenditure at the present time. The erection of a cold store and putting in a small refrigerating machine is now being considered.

Stockton.—The Stockton Distilled Water Ice Manufacturing Co. has been organized and incorporated by Geo. L. Wolf, R. B. Teefy, Jos. Fyfe, A. C. White and E. S. Van Meter with a capital of $70,000, and proposes to erect a plant for the manufacture of ice, to be ready for operation this season. A 50-ton plant is proposed.

CANADA.

Toronto.—The Artesian Ice Co., Limited, has been organized with a capital stock of $1,000,000, and will build, it is reported, a plant for the manufacture of ice, to have a capacity for 100 tons daily, and to build in connection a cold storage warehouse.

Victoria, B. C.—Clayton & Coster will equip their new brewing plant with a 6-ton refrigerating machine, contract for which has been awarded to the Fred W. Wolf Co., of Chicago.

COLORADO.

Pueblo.—Winn & Co., butchers, are preparing to cool their provision box at the Second street store with mechanical refrigeration, a machine to cost $3,000 having been purchased.

CONNECTICUT.

Hartford.—The Linden hotel is being equipped with a 2-ton refrigerating and half-ton ice making plant, by the Frick Co., of Waynesboro, Pa.

CUBA.

Pinar Del Rio.—Mr. Jeremiah Howard, of New York city, will erect an ice plant here. Contract has been awarded to the York Manufacturing Co., of York, Pa., for one of their latest improved 10-ton can ice making plants. Machinery for this plant will be ready for shipment June 1.

DISTRICT OF COLUMBIA.

Washington.—The Union Trust and Storage Co., which has recently let contracts for the construction of a large general storage warehouse, has decided, it is stated, to erect, adjoining the main building, a structure for cold storage purposes, to be 95×50 feet in size, and four stories high.

Washington.—The commissioners of the District have appropriated $14,500 for the erection of a central storehouse, refrigerating and cold storage plant at the insane asylum.

GEORGIA.

Carrollton.—The Bremen Canning and Ice Co., recently organized, is preparing to build a plant for the manufacture of ice, and for canning fruits and vegetables.

Hawkinsville.—N. F. Buff is in the market for a 3-ton ice machine.

Macon.—William E. Godfrey, 129 Appleton avenue, proposes to erect cold stores, and desires estimates from manufacturers of refrigerating machinery.

Marietta.—Geo. F. Gober, it is stated, has just completed a plant for the manufacture of ice, equipped with a 15-ton ice machine, by D. L. Holden, of Philadelphia.

Waycross.—The Satilla Manufacturing Co. is preparing to enlarge its plant by the addition of a 50-ton ice machine. A storage room, to have a capacity for 500 tons of ice, is also to be erected. The company holds the contract for re-icing the fruit and vegetable cars coming through here from Florida.

HAWAIIAN ISLANDS.

Honolulu.—Jas. S. Espy and A. S. Cross are building here a plant for the manufacture of ice, as stated in last month's issue of ICE AND REFRIGERATION. D. L. Holden, of Philadelphia, has been awarded contract for supplying the 15-ton ice making machine required.

ILLINOIS.

Batavia.—The Batavia Farmers' Creamery Association are equipping their creamery with a 4-ton refrigerating machine, using the brine storage system. Contract for machinery was awarded to the Creamery Package Manufacturing Co., of Chicago.

Chicago.—Work has begun on the cold storage plant being constructed by the Northwestern University under a thirty years' lease for A. Booth & Co., of Chicago. A building, 135×200 feet, seven stories high, will be erected. A refrigerating plant of about 300 tons capacity will be required, for which figures are now being taken by A. Booth & Co.

Chicago.—C. F. Gunther, candy manufacturer, has decided to equip his State street store with a 2-ton direct expansion carbonic anhydride refrigerating plant, to be installed by Kroeschell Bros. Ice Machine Co., of this city.

INDIANA.

Anderson.—It is reported that the Knights of the Royal Arch, an organization composed of saloon men, have decided to build a 25-ton ice making plant here this season.

IOWA.

Ottumwa.—A large cold storage warehouse is to be erected here shortly by the Anheuser-Busch Brewing Association, of St. Louis.

Vinton.—The Benton County Creamery Co. is negotiating for a small refrigerating machine, to be installed at the creamery.

Waterloo.—A company is being formed which proposes to erect a cold storage plant, to cost about $100,000.

KANSAS.

Hutchinson.—The Hutchinson Ice Co., whose improvement was mentioned in last month's issue of ICE AND REFRIGERATION, will have a 30-ton absorption ice machine installed by the Ice and Cold Machine Co., of St. Louis, Mo.

LOUISIANA.

Abbeville.—The Abbeville Ginning and Ice Manufacturing Co. is erecting a plant for the manufacture of ice at this point, and has already contracted with the A. H. Barber Manufacturing Co., of Chicago, for a 5-ton ice making plant.

New Orleans.—The Louisiana Distillery Co., Ltd., will put in a 6-ton ice plant, to be used for cooling water in the distillery. The machinery will be supplied by the Frick Co., of Waynesboro, Pa.

MAINE.

Portland.—The Portland Cold Storage and Terminal Co. has been organized with E. Franklin Clements, of New York, as president, and Chas. P. Mattocks, of Portland, as treasurer, for the purpose, it is reported, of equipping and operating a cold storage plant. A capital of $500,000 has been subscribed. The manufacture of ice is an incidental part of the proposed plans. It is reported that the same company is also interested in a cold storage plant to be erected at Halifax, N. S., and to be operated in conjunction with the Portland plant. The plans include the erection of a seven-story building, 100×90 feet in size, on the water front, convenient to ocean transport.

MASSACHUSETTS.

New Bedford.—Local capitalists are considering a proposition to take stock in a proposed company, to build and operate a plant for the manufacture of ice.

Provincetown.—The Provincetown Cold Storage Co. is building a plant for the manufacture of ice, and has entered into contracts with the Frick Co., of Waynesboro, Pa., for a 10-ton ice plant, water distilling system, room piping, etc.

MICHIGAN.

Battle Creek.—The Phelps Medical Surgical Sanitarium Co. are equipping their sanitarium with a 4-ton refrigerating machine, furnished by the Creamery Package Mfg. Co.

Cadillac.—The old Burke hotel structure is to be torn down, and in its stead the Anheuser-Busch Brewing Association, of St. Louis, Mo., will erect a modern cold storage plant. The building will be of brick, two, possibly three, stories in height.

Saginaw.—The Saginaw Produce and Cold Storage Co., organized in February last, have built a new building and are equipping the same with a 10-ton refrigerating machine, using direct expansion, supplied by the Creamery Package Manufacturing Co., of Chicago.

Grand Rapids.—The Grand Rapids Cold Storage Co. is putting in a complete system of ventilation, and intends also to install an additional 10-ton compressor and 100-horse power engine, with boiler, this season.

MINNESOTA.

St. Cloud.—The St. Cloud Cold Storage and Produce Co., Gale & Whitney, proprietors, whose proposed cold storage plant was mentioned in ICE AND REFRIGERATION for December, 1899, are equipping their warehouse with a 10-ton refrigerating machine, using direct expansion, equipment being furnished by the Creamery Package Manufacturing Co., of Chicago.

MISSOURI.

Webb City.—Herrod Bros. are erecting a building adjoining their meat market, to be used for cold storage purposes. A 4-ton refrigerating machine will be installed.

MISSISSIPPI.

Columbus.—Samuel Kaye is erecting a new plant for the manufacture of ice, and has already contracted with the Henry Vogt Machine Co., of Louisville, Ky., for a 15-ton machine.

Senatobia.—This town is anxious for an ice factory, there being none nearer than Memphis, and efforts are under way to organize a company to erect and operate a plant.

NEW JERSEY.

Newark.—The Krueger Hygiene Ice Co. is building an addition to its plant, which is to be equipped so as to increase the capacity from sixty tons to ninety tons of ice daily. The new building is to be 128×32 feet in size, and cost about $12,000.

NEW YORK.

Flushing, L. I.—The Kissena Lake Ice Co.'s plant here, which was destroyed by fire recently, will be rebuilt at once. Such of the machinery as was not destroyed by the fire will be overhauled and repaired and new parts furnished to put the plant in a first-class condition. The contract for this work has been awarded to the York Manufacturing Co., of York, Pa. This company will also install at the same time one of their latest improved 35-ton can ice making plants, and when completed the total capacity of the plant will be sixty tons. The original plant was of twenty-five tons capacity.

Hudson.—C. A. & Julian Van Deusen have equipped their warehouse for meats and provisions with an absorption refrigerating machine, installed by the Carbondale Machine Co., of Carbondale, Pa. The new building is 60×18 feet in size, divided into compartments, where the temperature can be kept at any desired degree from 30° F. in the egg room to 15° in the butter room. This improvement was first mentioned in the March issue of ICE AND REFRIGERATION.

New York.—The Colonies Hygeia Ice Co. has been formed with $100,000 capital, and proposes to build a plant for the manufacture of ice at Manila, Philippine islands. Frank R. Walton is the promoter.

New York.—A number of butchers, grocers and saloon men have been endeavoring to form a co-operative company for the purpose of building and operating one or more ice making plants in this city. Labor unions, headed by the New York Central Labor Union, are also agitating schemes for erecting and operating ice making plants. Whether any of these schemes will be realized is extremely problematical.

New York.—The Western Electric Co. has decided to equip its building with a 6-ton refrigerating machine, contract for which has been let to the Frick Co., of Waynesboro, Pa.

Wyoming.—Simeon Howard is erecting a building to be equipped and used for cold storage purposes.

NORTH CAROLINA.

Henderson.—P. T. Jones contemplates the erection of an ice making plant, and asks for bids for machinery.

OHIO.

Cincinnati.—The Gibson house is to be equipped with a 2-ton ice and a 10-ton refrigerating plant, which will be installed by the Frick Co., of Waynesboro, Pa.

Gallipolis.—J. V. Gill is about to erect a building to be used as a cold storage warehouse. Work on the foundation has begun.

Lorain.—The Lorain Brewing and Ice Manufacturing Co. has been organized, and proposes to build and operate a brewery and ice factory. A $100,000 plant is proposed.

PENNSYLVANIA.

Bethlehem.—The Mineral Spring Ice Co., Geo. W. Rhoad, president, W. J. Semple, secretary, is enlarging its plant by the addition of a 50-ton ice machine, installed by D. L. Holden, of Philadelphia. The machine will be operated by water power, and was to be finished ready for operation about June 1.

Butler.—D. B. Campbell, whose proposed new plant was first mentioned in the January issue of ICE AND REFRIGERATION, has completed the building and equipped same, it is stated, with a 25-ton ice making plant, supplied by D. L. Holden, of Philadelphia.

Pittsburg.—The Liberty Market Cold Storage Co. is improving its plant by the addition of several new cold storage rooms, to be equipped with the latest improvements in ventilating and air circulating apparatus. The rooms will be made fireproof and finely finished for the storage of furs, fine woolens, carpets, rugs, etc. The plans and specifications for the improvement were made under the supervision of Mr. Madison Cooper, by the engineering department, Produce Refrigerating Co., Minneapolis, Minn.

Pottsville.—R. A. Sylvester is equipping his commission house with a 4-ton refrigerating machine, using direct expansion, equipment furnished by the Creamery Package Manufacturing Co.

Sewickley.—The Hoskannini Co. are having a 1-ton ice making plant installed by the Kroeschell Bros. Ice Machine Co., of Chicago.

PHILIPPINE ISLANDS.

Cebu.—A plant for the manufacture of ice is being erected here under the auspices of the representatives of the United States government.

Manila.—The Colonies Hygeia Ice Co. has been organized in New York city, N. Y., and propose to erect here a plant for the manufacture of ice.

RHODE ISLAND.

Narragansett Pier.—The 17-ton Barber Manufacturing Co. ice machine, reported in the May issue of ICE AND REFRIGERATION as about to be installed in the "Northern hotel," was so given by mistake. It should have been S. W. Mathewson's hotel.

Providence.—The Providence Brewing Co. is having installed at its brewery a new 50-ton ice making plant. The machinery was supplied by the Frick Co., of Waynesboro, Pa.

SIAM.

Bangkok.—The Bangkok Manufacturing Co. has contracted with the Frick Co., of Waynesboro, Pa., for a 6-ton ice-making plant, can system, and a water distilling plant, to be erected here.

SOUTH CAROLINA.

Manning.—The Manning Oil Mill and Illuminating Co., recently incorporated, will erect, it is stated, an oil mill, electric lighting system, and a 20-ton ice making plant. F. P. Ervin is manager.

SOUTH DAKOTA.

Central City.—The Black Hills Brewing and Malting Co. is preparing to equip its plant with a refrigerating machine, said to be the first machine of this nature in the Black Hills region.

TENNESSEE.

Bristol.—The Diamond Ice Co., whose proposed improvement was mentioned in ICE AND REFRIGERATION for December, 1899, has had installed, it is reported, a 25-ton ice machine, furnished by D. L. Holden, of Philadelphia.

TEXAS.

Palestine.—The Palestine Packing Co. is improving and enlarging its plant, and will put in machinery for a cold storage house.

UTAH.

Salt Lake City.—The plant of the A. Fischer Brewing Co. is to be greatly improved this season, including the installation of a new ice machine, new boilers, a complete cold storage plant, etc. The improvements will involve an outlay of about $25,000.

VIRGINIA.

Norfolk.—R. B. Fentress, who was granted a franchise in April to lay pipes in streets for the purpose of supplying refrigerated air to merchants, has begun laying pipes, and the first of these, on East Main street, will be in operation, it is stated, by June 15.

WASHINGTON.

Aberdeen.—Ninemire & Morgan, wholesale butchers, have begun the construction of an abattoir and packing house, and will erect in connection an extensive cold storage warehouse.

Seattle.—The Washington Cold Storage Co., recently organized, has begun the construction of a cold storage plant, with a capacity of about 3,000 tons. The buildings will be 180×112 feet in size, and be equipped with modern machinery. The plant is to cost about $50,000. A general storage house of 10,000 tons capacity is also to be erected. The officers of the company are: President, C. H. Hamilton; vice-president, P. F. Kelly; treasurer, J. S. Goldsmith.

Walla Walla.—Messrs. Burford & Eagan have completed their ice making plant, mention of which was made in the January issue of ICE AND REFRIGERATION. The firm now intends, it is stated, to add a cold storage warehouse for preserving meats, fish and other perishable goods.

NEW INCORPORATIONS.

——The Cincinnati (Ohio) Ice Co. has reduced its capital stock from $1,000,000 to $420,000.

——The Washington Cold Storage Co., Seattle, Wash., has been incorporated with a capital of $25,000.

——The Diamond Ice and Fuel Co., Spokane, Wash., has been incorporated. Capital, $100,000.

——The Produce Cold Air Co., Chicago, Ill., has been incorporated by D. E. Johnson and others. Capital stock, $500,000.

——The Ardmore Ice Manufacturing and Storage Co., at Ardmore, Pa., has been chartered with a capital stock of $50,000.

——The Colonial Ice Co., of Cleveland, Ohio, has been incorporated by M. J. Uline, J. Stevan, Jas. Brown and others. Capital, $2,000.

——The Hartford (Conn.) Co-operative Ice Co. was incorporated May 15 by C. L. Palmer, G. F. Kellogg, L. F. Guethlein and others. Capital, $10,000.

——The Rochester Packing and Cold Storage Co., of Rochester, N. Y. Capital, $60,000. Directors: John U. Schroth, of Greece, and George N. Bohrer.

——The Portland Cold Storage and Terminal Co., Portland, Me., has been incorporated by E. F. Clements and C. P. Mattocks. Capital, $500,000. Not paid in.

——The Marshall Ice and Refrigerating Machine Co. has been incorporated at Newark, N. J., by O. A. Miller, W. B. Schaff and Oscar L. Lefferts. Capital, $150,000.

——The Blackwell Ice Co., Blackwell, Okl., has been incorporated by A. Ruemmeli, of St. Louis; Dave Shonwald, W. A. Hays and B. F. Loomis, of Blackwell. Capital, $25,000.

——The Stockton (Cal.) Distilled Water Ice Co. was incorporated May 8 with $50,000 capital. Directors: R. B. Feefe, Joseph Feefe, G. L. Wolf, A. C. White and E. S. Van Meter.

——The Bronx Consumers' Ice Co., of New York, has been incorporated with a capital of $100,000. Directors: John H. Koenig, Frederick Bucker, J. Siegfried, Henry Kruse and F. Holderman.

——The Market Ice Co., of New York, has been incorporated with $20,000 capital. Directors: Augustus J. G. Warner, of Jersey City, and Carlton M. Prankard and N. Stanton Gates, of Brooklyn.

——The Owen Manufacturing Co., Rochester, N. Y., has been incorporated by F. C. Owen, C. E. Gardiner and others, Capital, $25,000. Object, to manufacture ice machines, filters, etc.

——The Philadelphia (Pa.) General Liquefied Air and Refining Co. was incorporated May 18 by C. S. Rusling, of New York, J. J. Kromer, of Wenonah, N. J., and others. Capital, $1,000,000.

——The People's Ice Co., Atlanta, Ga., has been incorporated by H. and E. S. Behre and T. B. and P. H. Brady. Capital, $250,000. Object to build and operate an ice making and cold storage plant.

——The Kinde Creamery Association, Kinde, Mich., has been incorporated by T. Shine, G. Carty, B. A. Stoddard and others. Capital, $5,000. Objects, to establish a creamery and make butter, cheese, etc.

——The Tropical Ice and Coal Storage Co., of Tampa, Fla., has been incorporated, with a capital of $20,000, to manufacture ice, conduct cold storage and coal business, etc. W. R. and T. H. Moore, J. L. Kelly and G. C. Edwards are directors.

ONE of the incidental uses for the refrigerating machine is found in mining. At great depths or at comparatively shallow depths in some mines work on valuable veins of metal or coal has been abandoned, because of the heat. It is reported that in some of the shafts of the Rand gold mines in South Africa this problem is already being presented. In some places 5,000 or 6,000 feet, and in most places 12,000 feet, is declared to be the limit of depth where men would be capable of working. But refrigerating engineers declare that with the use of modern refrigerating apparatus to cool the air it will be quite possible to go several thousand feet lower in case a rich vein of precious metal or even of coal warranted the additional expense.

F. W. PILSBRY, connected for many years with the Fred W. Wolf Co., the well known builders of the "Linde" ice and refrigerating machines, at Chicago, Ill., resigned his position recently and has been taking a needed rest.

ICY ITEMS.

——The Ripley artificial ice plant, at Ripley, Ohio, was sold last month at sheriff's sale for $1,210 to John Sauer.

——Geo. H. Geissler and George Bean have purchased the plant of the Yuma Ice Co., at Yuma, Ariz., and will operate the same.

——The plant of the Aurora Pure Ice Co., at Aurora, Ill., has been purchased by L. C. Riggs & Son, of Chattanooga, Tenn.

——A. F. Tucker, of St. Louis, has been placed in charge, as manager, of the plant of the Joplin Ice and Refrigerating Co., recently completed at Joplin, Mo.

——Bids for an electric plant to light the town of Crisfield, Md., are asked for up to June 15, 1900, the specifications being at the office of the Crisfield Ice Manufacturing Co.

——Jacob Ruppert's new ice plant in New York, which is to have a capacity of 1,000 tons of ice daily, has been equipped with twelve automatic air pressure lowering machines by Gifford Bros., of Hudson, N. Y.

——The North Pacific Norway Fishing and Packing Co. has been organized at Minneapolis, Minn., with a capital of $1,000,000, by M. R. Straight, of New Whatcom, Wash. The manager of the company will be Joseph Kildall, of Minneapolis, Minn.

——The increase in the business of R. D. Lane & Co., manufacturers of special packings, caused the firm to move from 81 Centre street, New York, to more commodious quarters, at their new factory, 210 and 212 Canal street, where new machinery has been installed.

——The Long Island Produce Co., of Southold, Suffolk county, N. Y., has been formed by the consolidation of the former company of the same name and the East New York Produce and Ice Co. W. R. and W. S. Newbold and Frank S. Wells are directors of the new company.

——J. L. Jaquot, of Appleton, has purchased the two-thirds interest of Messrs. Eldredge & Briggs in the Neenah Cold Storage Co., of Neenah, Wis., the other third interest being still owned by N. Simon. The plant will be under the management of Mr. Cutler, of Appleton, Wis.

——The Dyersburg Ice and Coal Co. has been merged into a stock company, with the following shareholders: W. O. Brandon, John N. Parker, George R. Minnick, J. E. Harrell, and S. A. Wood, with a capitalization of $15,000. The plant will be enlarged so as to be able to meet all demands made on it. W. O. Brandon will be the manager.

——The Pacific Cold Storage Co., Tacoma, Wash., Chester Thorne, President. Charles Richardson, secretary and treasurer, and A. W. Sterrett, manager, has overhauled the machinery in their extensive cold storage plant on the wharf, and will operate same to its full capacity. The company makes a specialty of freezing meats and fish and storing eggs and dairy products.

——The Seaside Ice Manufacturing and Cold Storage Co., Atlantic City, N. J., have completed their new plant and commenced operating it. The York Manufacturing Co.'s ice machine, compression system, has a capacity of fifty tons of ice daily, while the fourteen cold storage rooms have an aggregate capacity of 44,000 cubic feet of cold storage space. T. A. Sellers is the local manager.

——The West Jersey Ice Manufacturing Co., of Camden, N. J., has given a contract to the York Manufacturing Co., of York, Pa., for overhauling and repairing their ice making plant in this city. The contract, among other things, calls for the replacing of the double-acting compressors (oil system) on their machines, with latest improved single-acting compressors of the York Manufacturing Co.'s make.

——G. Frank Lidy, has recently contracted with A. J. Morris, of Kansas City, Mo., on behalf of La Internacional Compania Exportado S. A., of Chihuahua, Mexico, for a 100-ton Vilter refrigerating and ice making plant, to be erected at the company's slaughtering and packing house, now being erected at Chihuahua. A description of said plant and the *personnel* of the company were given in the March issue of ICE AND REFRIGERATION.

——The Standard Ice Manufacturing Co.'s new 360-ton plant at Philadelphia, Pa., recently completed, is equipped with many modern conveniences, not the least among which are the four Gifford Bros.' automatic air pressure lowering machines, as well as several endless chain conveyors put in by the same firm, and also the easy control of openings, by the use of eleven of the Stevenson Co., Limited, combined self-closing door and chute devices.

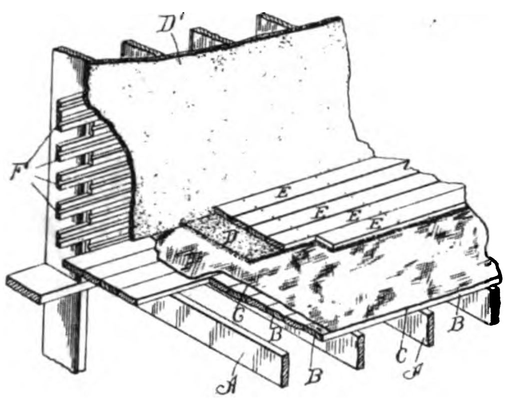
——Chas. H. Leinert, for the past six years connected with the De La Vergne Refrigerating Machine Co. as their New England and Canadian manager, has severed his connection with that company, to assume the position of treasurer and general manager for the Winthrop Spring Hygeia ice plant and for the Yale brewery, both of New London, Conn. Mr. Leinert is well known to the ice trade, having been connected at various times during the past twelve years with C. G. Mayer, the Fred W. Wolf Co. and the De La Vergne Co., and having been at one time vice-president of the Nason Ice Machine Co. His many friends will wish him well in his new field.

WE append below the most important new patents relating to the ice, ice making, refrigerating, cold storage and kindred trades that have been issued from the patent office during the past month, reported expressly for ICE AND REFRIGERATION. All inquiries relative to patents or trade marks in the United States and foreign countries should be addressed to William S. Beaman, counsellor at law and solicitor of patents, 99 Cedar street, New York city.

REFRIGERATOR-CAR OR THE LIKE.

648,979. John M. McMahon, Omaha, Neb. Filed March 29, 1899. Serial No. 10,932. Patented May 8, 1900. (No specimens.)

Claim.—1. A floor for refrigerator cars, cold storage rooms, and the like, comprising a primary floor of suitable material, a layer of insulating compound supported thereon, consisting of powdered soapstone, mica, plumbago, short lengths of stranded oakum, and a liquid bituminous material, substantially as described, and planking laid and secured upon the insulating compound, substantially as and for the purpose set forth.

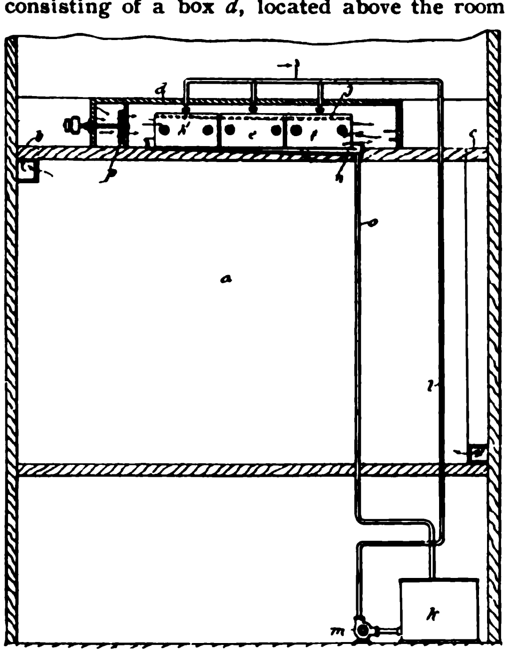


2. A floor for refrigerator cars, cold storage rooms, and the like, comprising a primary supporting structure, a layer of non-conducting material thereon, a layer of insulating compound supported thereon consisting of powdered soapstone, mica, plumbago, short lengths of stranded oakum, and a liquid bituminous material substantially as described, and planking laid and secured upon the insulating compound, substantially as and for the purpose set forth.

APPARATUS FOR COOLING AND DRYING REFRIGERATING OR FREEZING ROOMS.

No. 649,558. Carl W. Vollmann, Montreal, Canada. Filed March 25, 1899. Serial No. 710,503. Patented May 15, 1900. (No model.)

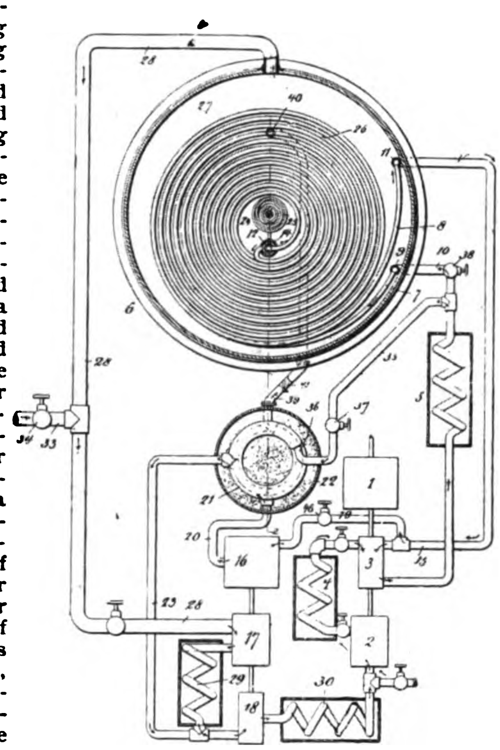
Claim.—Apparatus for drying and cooling refrigerating or freezing rooms, consisting of a box *d*, located above the room to be dried and cooled, air conductors *b* and *c*, communicating respectively one with each end of said box; a fan *p* located within the conductor *b*; one or more transverse series of longitudinally arranged vertical cooling plates *e*; bolts *g* and sleeves *f* for supporting and localizing said plates; a series of horizontal perforated plates *j*, each of which occupies a central position in the space between said vertical plates at their upper end so as to leave an open space between its edges and two adjoining vertical plates; a supply gutter *h'* extending transversely over each of said series of vertical plates and the horizontal plates between them; a tank *k* located below the room; a pump *m*; flow pipes *l* connecting said tank to said pump, and said pump to said gutters; a collecting pan *n* located beneath said series of plates; and a return pipe *o*, connecting said pan to said tank, substantially as described and for the purpose set forth.



LIQUEFACTION OF AIR.

No. 647,514. Oscar P. Ostergren, New York, N. Y., assignor of one-half to Samuel M. Gardenhire, same place. Filed August 26, 1899. Serial No. 728,544. Patented April 17, 1900. (No model.)

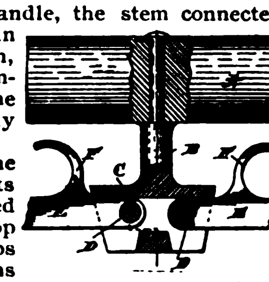
Claim.—1. In an apparatus for the refrigeration or liquefaction of aeriform fluids the combination of a counter-current condenser having incoming and outgoing channels, a compressor and cooler connected to the incoming channels a connection from the outgoing channels to the compression cylinder of said compressor, a second compressor, a branch from said last mentioned connection to the power cylinder of said last mentioned compressor, a precooler having a plurality of coils, a connection between the exhaust side of said compressor power cylinder and one end of one of the coils of said precooler, a connection between the opposite end of the said precooler coil and the compression cylinder of said second mentioned compressor, and a connection between the discharge side of said second mentioned compressor compression cylinder and the intake side of the compression cylinder of the first mentioned compressor.



ICE TONGS OR GRAPPLE.

No. 648,886. William R. Smith, Nicholson, Ky. Filed November 7, 1899. Serial No. 736,182. Patented May 1, 1900. (No model.)

Claim.—1. In ice tongs, the handle, the stem connected thereto, and the arms pivoted in the lower portion of the stem, and provided with the hooks *F*, combined with tongs *G* pivoted to the lower end of the arms, substantially as shown.

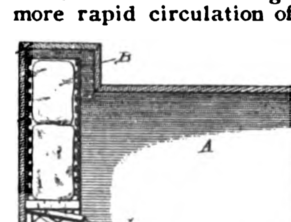


2. In ice tongs, the handle, the stem secured thereto and having its lower end made hollow and provided with a stop *d* and the arms *E*, the top of the box-like portion serving as stops for the upward movement of the arms *E*, combined with tongs *G* secured to the lower ends of the arms, substantially as described.

REFRIGERATOR OR COOLING ROOM.

No. 648,779. Silas Northey, Waterloo, Iowa. Filed November 19, 1898. Serial No. 696,900. Patented May 1, 1900. (No model.)

Claim.—In a refrigerating or cold storage room, for more rapid circulation of the air therein, etc., the provision chamber having the contracted extension of its top portion, said extension having an upwardly sloping side wall or walls; and the ice bunker extending from the bottom of said chamber, and projecting up within and near the top of said extension, said bunker being entirely open at the top, being entirely closed upon all sides thereof, and having air escape openings at the bottom, which bottom is formed by a drip pan inclined downwardly toward said air escape openings, whereby the air is caused to pass freely up said sloping side walls to and over the ice bunker, down through the entire depth of said bunker in immediate contact with the ice therein, and deflected by said inclined drip pan to escape at the bottom only of said bunker and refrigerator, substantially as specified.



STILL THEY COME.

THERE seems to be no end to the number of inventors who are reported in the daily press as having discovered some new process of making ice with chemicals. One on the Atlantic coast "will take water from the gutter and freeze it into pure ice by his revolving process." Another on the Pacific coast will "take a can within a can," pour in a freezing mixture and, presto! he has ice. It is when these parties try to sell their inventions, or offer stock to a credulous public, that the mischief comes. Money so invested is like money dropped into quicksand.

TRADE NOTES.

MESSRS. ERNECKE & SALMSTEIN, manufacturers of paint specialties at Chicago, Ill., announce that their business has outgrown the capacity of their old quarters on Clinton street, and that after June 1, 1900, they will occupy the entire three-story factory building at 295 Loomis street.

R. ADELSPERGER has recently been appointed supervising architect of the department of charities and hospitals, Havana, Cuba, *vice* Geo. W. Wessling, resigned. Many extensive building operations are under way or in contemplation in this department, and Mr. Adelsperger is desirous of securing catalogues, etc., from the trade. Domestic postage rates will be sufficient to carry mail to this department in the Cuban city.

WANTED AND FOR SALE ADVERTISEMENTS.

The charge for advertisements in this column is $2 each insertion for seventy words or less, and twenty-five cents for each additional fourteen words. No advertisements will be inserted unless accompanied by the necessary cash. Parties answering these advertisements must write to the addresses given, as the publishers decline to furnish any information concerning them.

Ice Machine for Sale.

FOR SALE. A 12-ton Linde refrigerating machine, brine system, good order, but little used, at a bargain. Address H. A. BUSH, Erie, Pa.

Wanted.

Capable young man of experience to sell refrigerating machines. Good opening for pushing man. Address "I. M.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Ice Factory for Sale.

A 10-ton ice factory in good town of 10,000 people, in state of Kentucky. No other factory and no natural ice dealer nearer than twenty miles. Address "ICE FACTORY," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Situation as Engineer.

A competent engineer who has had charge of a compression ice plant for the past five years is in want of a situation. Best references. "ICE ENGINEER," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

Ice Plant for Sale.

Controlling interest in a 30-ton plant, in a city of 25,000 inhabitants. Machine in good order. No natural ice to contend with. Satisfactory reasons given for selling. Address "A. B.," care ICE AND REFRIGERATION, 177 La Salle street, Chicago.

For Sale

Two [illegible] ice machines, made by Stilwell Bierce & Smith Vaile Co., fitted for belt and gear power.
One [illegible] machine.
One [illegible] H. P. [illegible]
One [illegible] inch flues, full front.
All of the above [illegible] new and in perfect condition.
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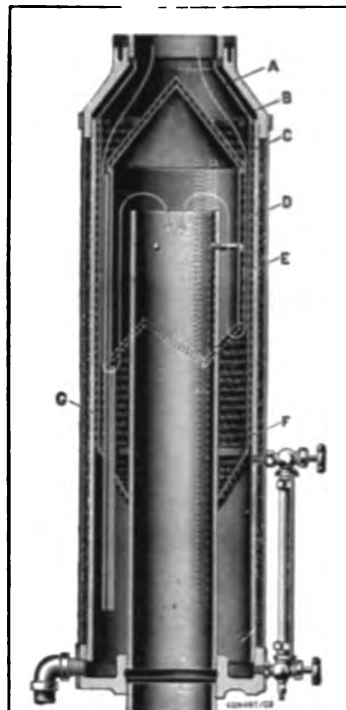

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WE GUARANTEE OUR BOILER CLEANSING COMPOUNDS

to positively prevent the formation of scale and remove the scale already formed, no matter of how long standing; also to prevent pitting and corrosion in steam boilers, without any injury to the boilers, their fittings or dependencies, or to any goods that you manufacture, and DO NOT WANT ONE DOLLAR OF YOUR MONEY until we convince you of these claims.

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IMPROVES THE QUALITY OF THE ICE

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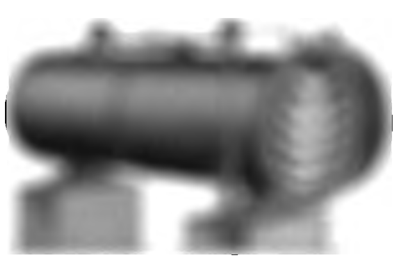
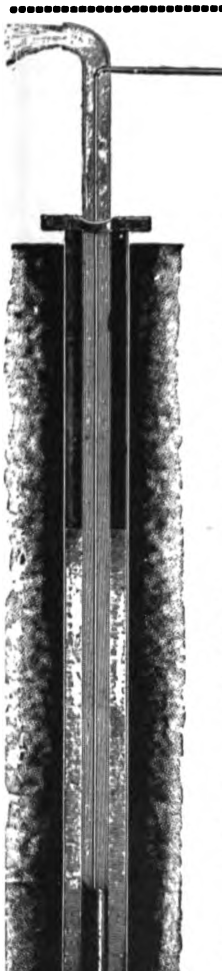
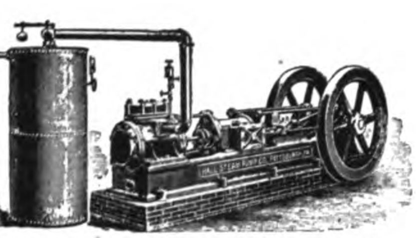
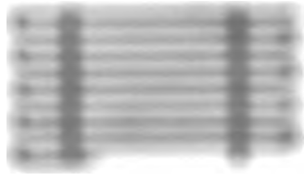


ICE CANS

ICE CANS







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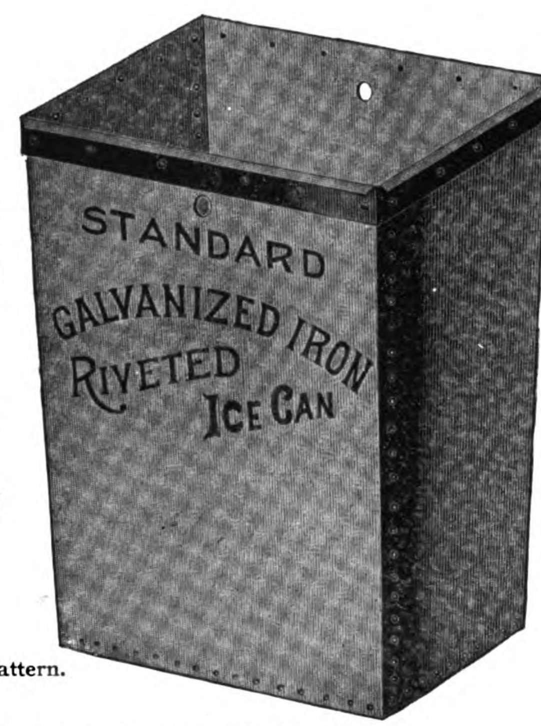

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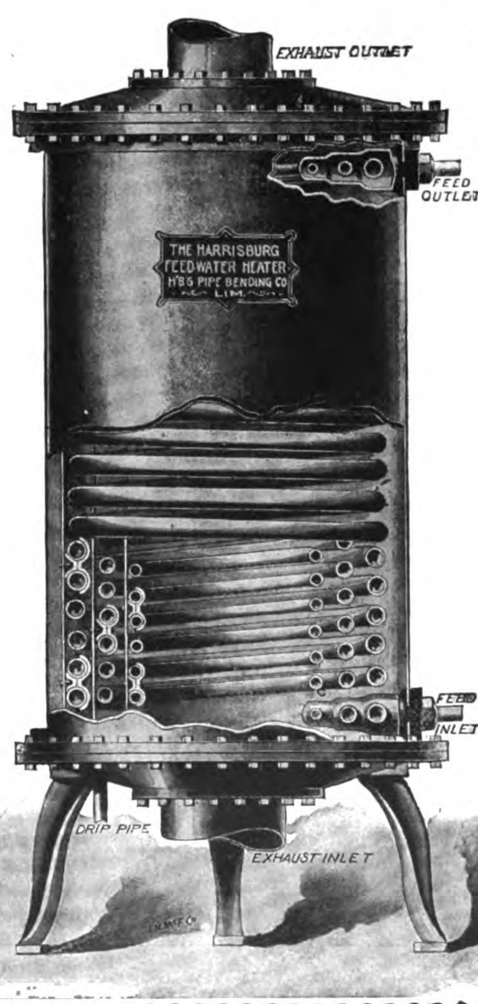

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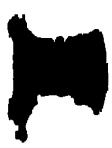

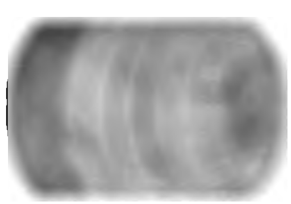

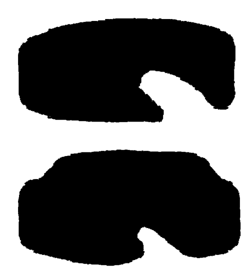

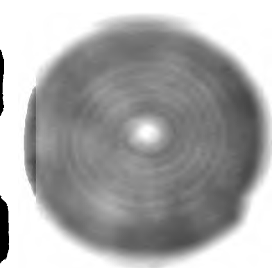

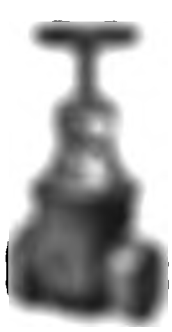

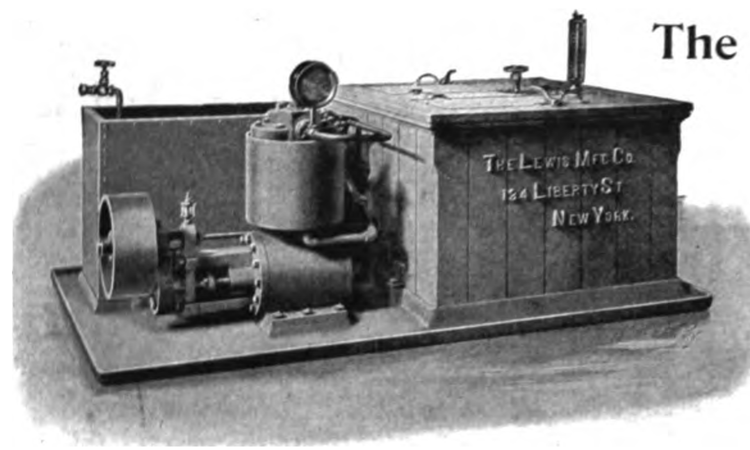

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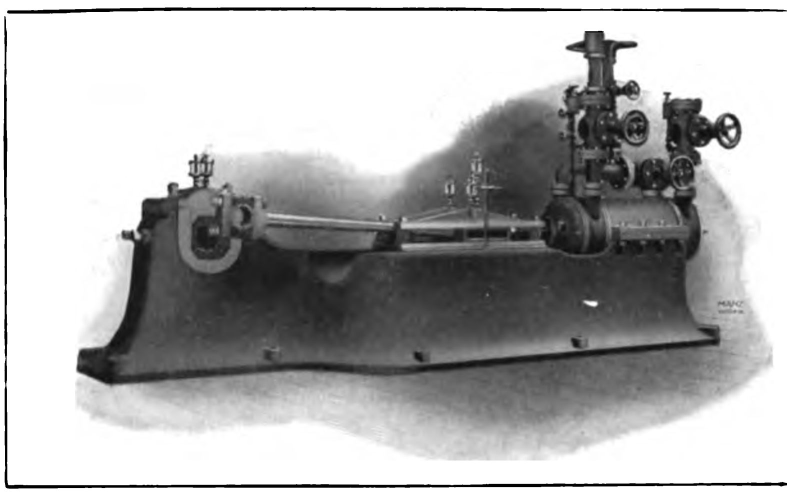

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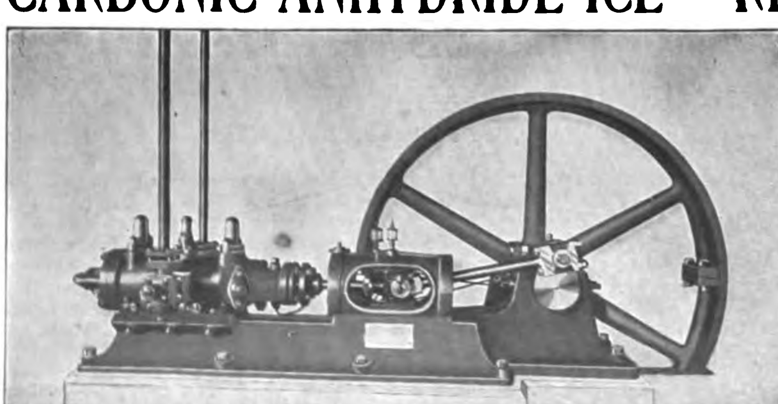

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Most simple, economical and durable. Applicable to all commercial purposes.

Complete installation for Ice Factories, Breweries, Cold Storage, Packing and Slaughter Houses, Hotels, Restaurants, Candy Factories. Also for Liquefaction of Carbonic Acid Gas.

No destructive fumes or poisonous gases. Complete safety of operation through the introduction of our safety device. Over 1,000 machines now in use.

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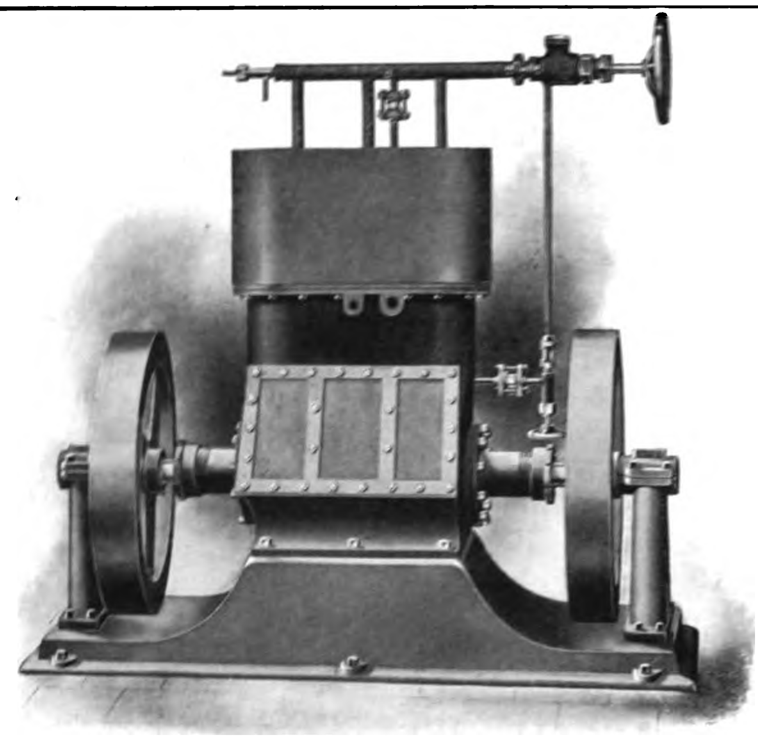

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SIMPLICITY, DURABILITY, HIGHEST EFFICIENCY.

Any one competent to operate motive power can operate them.

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FLOHR-WALTER CANDY CO.

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The Healy Ice Machine Co.

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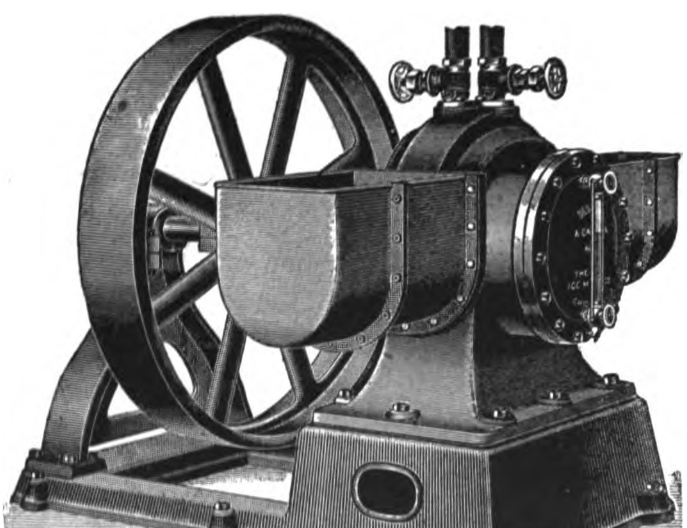

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IMPROVEMENTS INCLUDE:
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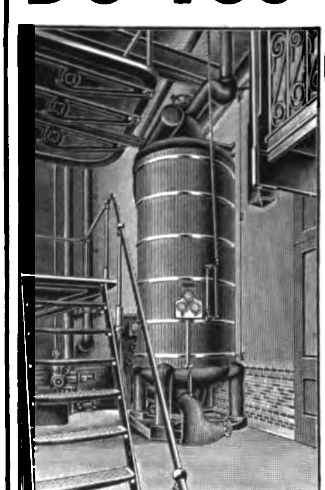

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SAVE COAL
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ALSO
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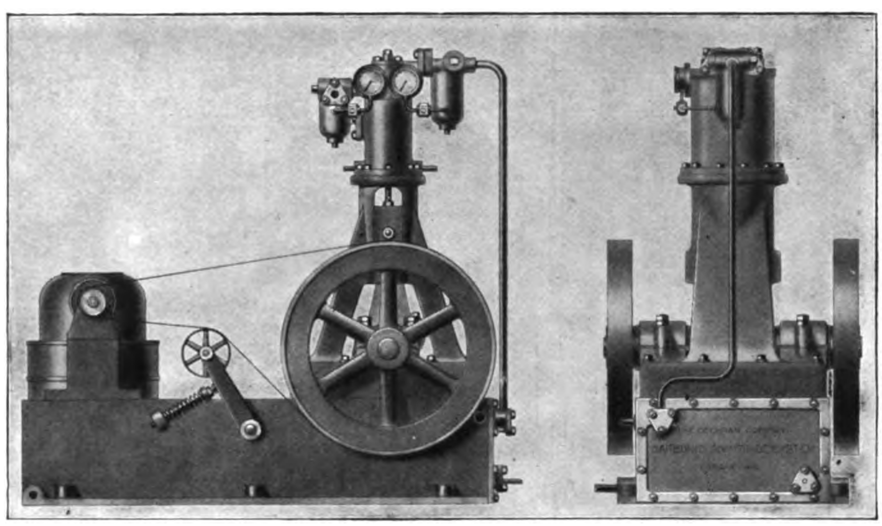
HAVE NO TERRORS FOR CONSUMERS USING

Carbonic Anhydride Refrigerating Machines

THIS IS THE ONLY SYSTEM AFFORDING

Absolute Freedom from Foul Odors—Low Temperatures—Perfect Safety



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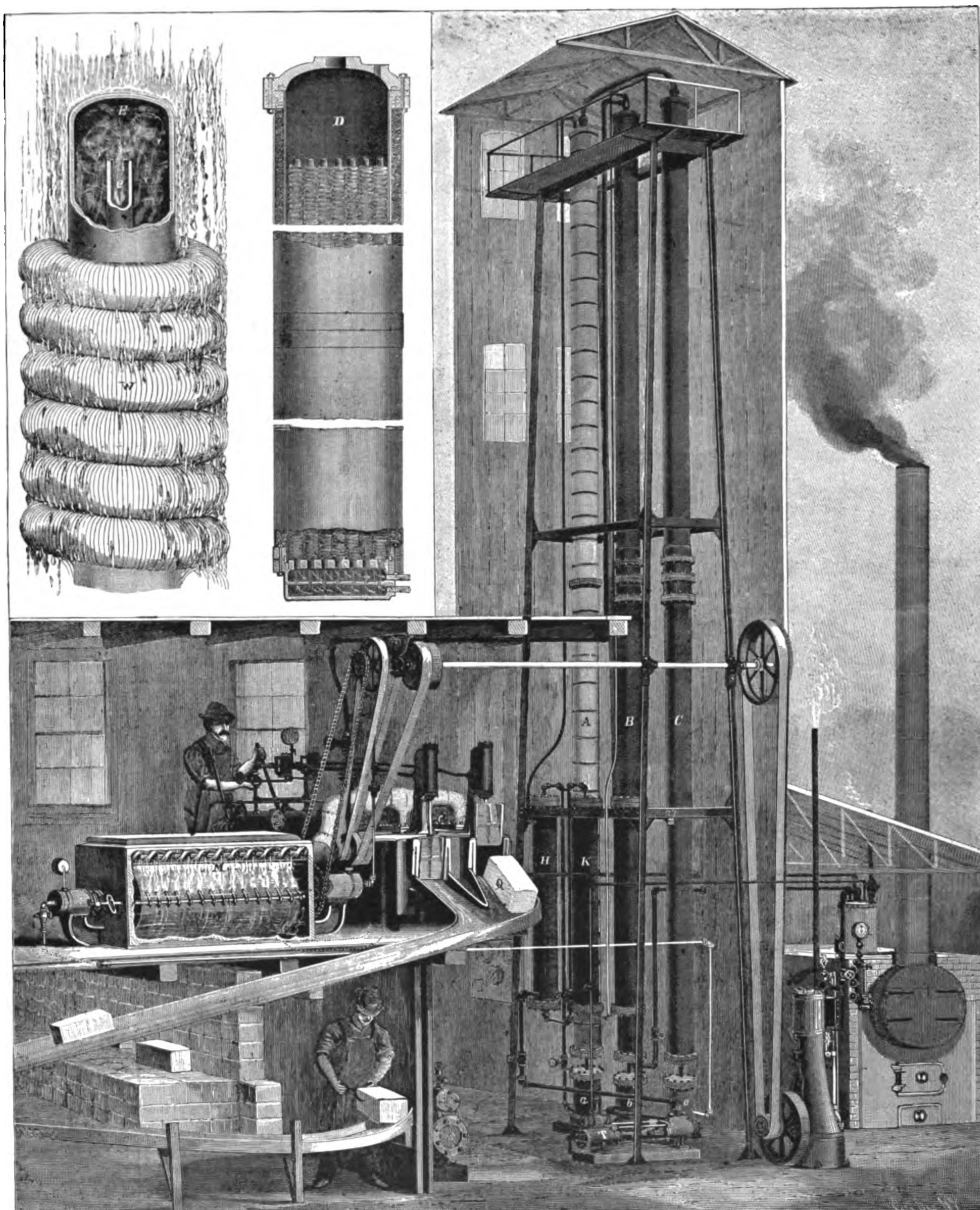

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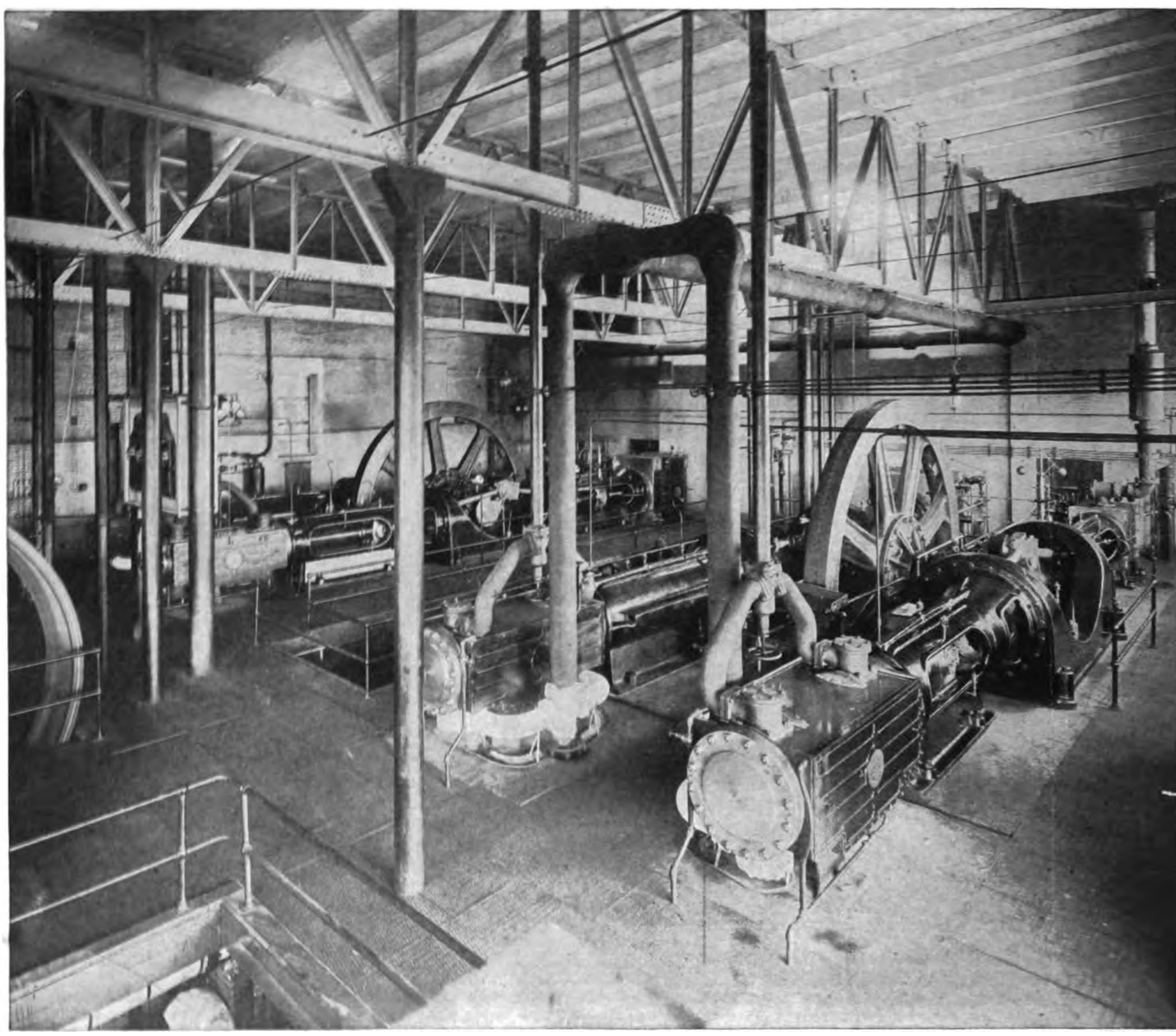

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